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The
INDIAN AMATEUR
DAIRY FARM,

CONTAINING

MOST USEFUL INFORMATION FOR THE DAIRY FARMER
ON DAIRY CATTLE MANAGEMENT, MILK, CREAM,
BUTTER, CHEESE, THE PRODUCTION OF MEAT,
GOATS, GOAT-MILK, PIGS, POULTRY,
RABBITS, PIGEONS, ETC., ETC.,

WITH A CHAPTER ON

BEEES AND THEIR TREATMENT IN INDIA,

BY

“LANDOLICUS,”

With 31 Wood-cut Illustrations.

Calcutta:

W. NEWMAN & CO., 4, DALHOUSIE SQUARE.

1895.

PRINTED BY W NEWMAN & CO., AT THE CAXTON PRESS, 1-2 MISSION
ROW, CALCUTTA, AND PUBLISHED BY W NEWMAN & CO , AT
4, DALHOUSIE SQUARE, CALCUTTA.

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INTRODUCTION

CHAPTER I.

THE few "Dairy-farms," properly speaking, that there are in India, are chiefly confined to towns, and these are principally in the hands of natives, managed in a very unsatisfactory way, and their products much adulterated, so much so, and in such a way, as not only to be repugnant, but they are also deleterious to health, and a frequent cause of the spread of diseases of most serious character, such as typhoid fever, cholera, small-pox, etc.

Of late years several private families have kept their own cows, and very properly so too, as by so doing such risks are avoided; but so great have been the difficulties attending their maintenance owing to the absence of reliable books of instruction, that it has proved anything but a satisfactory undertaking.

It is true that English modes of treating cattle are not in their entirety suitable to this country, but at the same time there is much in the practice of the treatment of cattle in India which should be avoided, and the English and Continental systems followed as nearly as possible. The introduction of a new system to the *goulah* or cowherd caste in India seems one that he abominates and abjures; but, let me ask, what new ways are ever pleasing to the natives of this country? Any innovation is always fought against

and shirked, whether in gardening, the keeping of a poultry yard, or cows.

It is remarkable, though, that perhaps the most useful of all domestic animals to the European in India has received the least attention of all, and is the most backward in every sense, and such a profitable industry as dairy-farming could be made to be surely deserves to meet with a better fate than to be left in the hands of natives, so much to the risk, too, of the community. It is well known *goalahs* will do as natives always will, and that is, follow the same lines as their forefathers from time immemorial.

These men should be made to know that when private families keep their cows, or dairy, they must do as they are bid with other people's cattle: that they in such case are the servants, and not the masters of the situation. Such orders as are given must be enforced firmly, yet with a certain degree of kindness, as leniency, or anything that tends to shew that the master *will not see* his orders carried out, is at once sufficient to make such people continue in the error of their ways and not do as may have been told them. The Author writes with a very long experience of India; and during his residence has kept cattle of various breeds, from time to time, hence can justly claim to have a knowledge of the native character and the subject under notice, having had special facilities to enable him to place the same before the reader. The English and Continental systems can be with advantage copied, subject to the modifications

pointed out. Those living in the suburbs of towns, residents of country places, mofussil stations, and lastly and especially, Indigo and Tea Planters, have greater facilities for keeping cattle thrown in their way than any other people in India ; residents of large towns are probably less favoured, because all green food has to be purchased, often at a high rate. Nevertheless, it will be seen in this book that it may be done profitably ; and when it can be done profitably, add to that how very much nicer and better the produce is than the nasty bazaar stuffs sold as milk, butter, and ghee which one has perforce to resort to when no cattle are kept

To a large class of people who find their way to India, dairy-farming would be a very suitable employment, but to start with they would require to have some capital. There is also the Eurasian, who is repeatedly appealing to Government for some mode of living, to whom it should be equally congenial and quite compatible with his dignity. Dairy-farming is far more likely to prove a lucrative speculation than farming alone, and more suitable to the constitution of European, Anglo-Indian, or Eurasian in India. But dairy farming is a profession, and, like all others, requires study and practice ; a fact which does not appear to have been considered by such Europeans who have tried it in this country, hence a few only have met with anything like success.

To those, however, who have a knowledge of the duties entailed in dairy-farming it would undoubtedly prove a profitable speculation, and it seems strange

there should be no such thing in our large towns as Dairy Companies, as well as Hackney Carriage Companies and other public conveniences, where the loss in live stock and wear and tear of vehicles leave so little margin for profit. But the cry is continuous that milk and butter are seriously adulterated, and a supposed cause of the most virulent diseases, and bad milk being, perhaps, next to bad water, the most condemned. Yet while the water-supply of Calcutta is as pure as science can make it, milk and butter remain of the same doubtful stamp, being supplied from sources that cannot be depended on; and when we consider these commodities form a good part of the diet of every one, more or less, while children are almost entirely dependant on milk, the necessity of a pure source of supply cannot be well over estimated.

When cow's milk, more or less adulterated, is bought at such dear rates, varying throughout India, it is a matter of surprise that goats are not more kept, when it is well known that their milk is more nutritive and more easily digested. Certainly there is a matter of prejudice regarding a peculiar taste, or what is called *gout* in the milk, especially when it is used freshly taken from the animal, but a great deal of this is got rid of when it is kept, after being strained, and then allowed to cool. It is much thicker than cow's milk, and, therefore, can stand dilution with water to make it of the same consistency.

In former times goats were kept in England in large flocks, but the cultivation of commons, which were the

free grazing places of these animals, checked the facility the poorer classes had for rearing them, hence the custom died out.

This is not the case in India, however, where they have no lack of opportunity to enjoy any amount of freedom, though they can be kept almost entirely confined, it being only necessary to have them taken out for a little fresh air once or twice a day.

Then the flesh of the kid and of the properly fattened goat is also a source of profit.

In Calcutta such a thing as a fat kid is hardly known, though it is hard to beat as a delicacy: the meat, too, of a well-fattened *khussi* (or castrated goat) *properly fed on gram, linseed, and such grains*, is quite devoid of strong flavour, and is only second, if at all inferior, to good mutton. In some districts where goats are properly fed up, goat's flesh has a peculiar excellence, well repaying the attention that has been given to it.

Reverting again to the subject of the cow when kept by people for private purposes, it is not necessary that they should confine themselves to the purchase of indigenous breeds only. Certainly imported cattle require greater attention, and at first are especially liable to ailments, more so than country breeds, but that should not be so serious an objection as to retard one from investing in them to be stall kept, that is, only allowed to graze, if at all, during the morning and evening, when the sun is not high. Under such circumstances an imported cow will probably suit a resident of a

town better than having to send out cattle to graze. These pages have been written with the object of suiting private people as well as the Dairy-farmer.

Buffaloes, though producing large quantities of milk, as kept in Bengal, require to be kept under conditions that would not suit Europeans, either privately or as Dairy-farmers: the cattle would be far too much in the possession of the native, more so than the cow. The milk of the buffalo has been shown by analysis to be richer than that of the cow, and its qualities have been commented on in one of the Calcutta daily papers. Tastes differ; but cow's milk is generally considered infinitely superior in every sense, though producing a smaller quantity of butter.

The subject of rabbits and pigeons also deserves attention, as well as poultry and bees; but poultry of any sort should not be allowed to invade the premises in which cattle are fed, as their feathers and droppings cause severe colic; fowls would therefore require to be always attended to and kept away from the cow-shed, so cannot be recommended, unless kept quite separated from the stalls and cow-shed or yard.

All house-keepers should be most careful to see the milk measured and butter weighed *every day*, after each milking and each churning, as the case may be; not long afterwards, but when the cow has been milked and when the butter has been churned, otherwise all chances of success are frustrated, as the milkman will

have his share, and the *khansama* his, before he presents the milk for inspection (which should be done by the *goalah*); and not only that, but the *khansama* will have a little more afterwards when he takes some for cooking or churning. If the *goalah* has not many cows to attend to, he should churn the milk for butter, which is the best method to adopt, if he be at all a trustworthy man.

Perhaps the reader of this small work may have kept cows himself, and has realised the very great trouble the majority of them give owing to the rascality of the *goalah*, of whatever caste he be. Don't be guided by this man; let him fairly understand when appointed he must do as he is told, and not as he chooses; that you are his master, and not he yours. Have your injunctions strictly carried out, and you will succeed; but if you do not persist in your orders being obeyed, you will soon find native customs creep in, till eventually *none* of your orders are obeyed, and then, my good reader, the cows are yours no longer, they practically belong to your *goalah*, and you will only have as much milk from *your* cows as he chooses; while if you persist at all, *something or other* will be wrong with this cow, and that with the other,—her calf is getting old, or other reasons will be shewn why they do not give more milk.

In such cases the only remedy is in your saying no more on the score of disappointments or what milk your cows should give, but to act at once. Don't give your *goalah* time to make matters worse; or he will give you reason to know your cows are *really* ill, or are being dried of their milk; act at once, discharge him, and get

a fitter sort of man, a more honest fellow. Some of these men are quite bad enough to do all I have written above, and more, because they see little chance of detection. There are bad characters among all castes, but *goalahs* are notably bad from one end of India to the other. *Ahires* are better than *goalahs*, as a rule. Musselmans are sometimes good ; but if you have any knowledge of a cow, appoint a man who knows how to milk and knows but little more ; make him learn how you wish the work done, and you will probably have the best servant, *but be sure you know sufficient to teach him*, culled from your own study of the subject, or practical experience. Your *khansama* robs you in his accounts when he buys your milk and butter, and robs you again when he has it in his hands, so you certainly cannot be worse off if you have your own cows, because you have the pure articles at home ; and if he does not rob you in buying the stuff he gets, he may, and in all probability will, purloin some milk, and butter too, after it is in his hands, hence the best method is to know what amount to give him for the purposes for which he requires it, and you will not be deprived of much. Of course it can be well understood your servants will resist in every possible way any innovation that may interfere with the nefarious way of increasing their incomes in the above manner.

All new-comers to India are imposed upon in these matters, some of them very much so ; but the real remedy lies in learning something of cattle and their produce, as well as of other things relating to domestic

economy, and it will then be realised that one gets for thirty rupees what another has to pay ninety rupees for. To sum up, the purloining of money and food is carried on more or less throughout the country, and is due chiefly to neglect or apathy in household matters.

The Author with these remarks concludes the Introduction to "The Indian Amateur Dairy farm," but suggests it should be carefully read and not omitted, as the preface to many books are, as being uninteresting and not to the point. The preface here is of special importance.

In Messrs. Newman & Co.'s series of books for the Indian Amateur, Poultry have been already dealt with at length, and this small work has been designed to fill up a much needed gap on the treatment of cattle, in health and disease in India. Poultry will only be touched on now and then in this book, as they must not be kept in a dairy-yard, unless restricted to separate quarters. Neglect of this rule will engender an unlimited amount of trouble and disease.

SITUATION OF FARM BUILDINGS AND THE FARM PASTURE LANDS, &c.



CHAPTER II.

IN this country, as in England, the Dairy-farm will be found more profitable where there is good pasture land; not to say that the cattle are to be *only* kept on pasture and thus be found to produce the most profit, and the largest return—No! I mean there is a certain time when it is best to keep cattle out in pasture land, to save expense, *viz.*, when cows are dry, and in the case of imported cattle, only taken out when it is cool.

The selection of a spot for a Dairy-farm requires careful consideration. It should be situated as near as possible to a market, that the produce may find a ready sale: it should be arranged so that the lease of a sufficient area of lands can be taken up around the place to admit of grazing fields, and plots to sow sugar-cane, carrots, and other root crops. For this, too light a soil is not good; moderately clayey land is the best, but it must not lie so low as to be swampy, or drainage will be necessary and entail expense.

Selection of a spot for a Dairy-farm.

If there are a few large trees on land taken up for pasture, so much the better, as they are useful for cattle to stand under during the heat of the day.

Presuming all the above circumstances have been taken into consideration, and the spot has been approved of, buildings and yards must be constructed for the use of the cattle, and to this attention is given further on ; in the meanwhile let the management of grass land be the subject to which special notice is given. Good care must be taken of this, more so here, than in England, where there is not so powerful a sun to contend against, nor the great dryness of the atmosphere that prevails over almost all India, from the month of February to the setting in of the monsoons : then, again, moisture in many districts is excessive and the growth of herbage rank and rapid, causing poorness in its nutritive qualities ; therefore such mixtures of grass must be made as will improve the general quality for feeding or grazing cattle. Good *Dool* grass is very fair, as far as fodders generally go in this country, but when mixed with other grasses it is more nourishing.

Also, it is best when the soil is manured or stirred or ploughed up occasionally. No land always kept in grass, cut and given to cattle, or grazed, can retain its fertility, nor can the grass be so abundant, neither can it be of a sufficiently nourishing quality to produce good cattle and good milk. Dung is good manure, especially that of cattle highly fed, such as are housed

and are giving milk and are hand-fed with different substances and grains, pointed out further on. Such cow-dung should be removed from the cow-shed or house twice a day, and placed in a heap in a pit, and there occasionally forked or turned over, *mixing in a little lime, which is necessary, but wanting in many soils* : a native soon learns the value of a pit for such operations. This heap must be covered over during the rains with a light roof, as the rain soon washes away a great portion of its valuable quality. When properly decomposed this should be scattered over the grass land, not in the dry season, but at the close of the rains, or a little before that time, which varies all over India, and on to the month of, say, January ; and further applications may be made of it after a little rain has fallen, but before the regular downpours, when the soil is moist. As in England after the application of manure in this way, the chain harrow should be passed over the land to scratch the surface of the soil, or the native plough might be used lightly. The former is easily made and saves a good deal of trouble. In England the stones would have to be picked off the soil, because they interfere with the scythe, but in this country the grass is cut with a sickle, hence it is unnecessary ; besides, in the plains, stones are not common.

When cow-dung cannot be obtained, artificial manures are used ; these would, I fear, be too costly in this country, barring, perhaps, chalk, which is a valuable manure for grass land, and guano, which is not so very expensive, being highly concentrated. Liquid manure,

for which a tank should be built, is also used with great advantage.

Grass land on which cattle graze is greatly improved if the cattle grazed on it are fed with an allowance of grain and oil cake made from linseed or cotton-seed. Cattle manure the pasture they are kept on, but they should have troughs or boxes for feeding in the field, and the droppings should frequently be scattered about, and not allowed to remain in patches.

Irrigation improves pasture lands in India, more so, perhaps, than in England, if done during the dry season of the year (from February to the middle of June, or when the monsoons set in). Sometimes as early as December irrigation of pasture land will handsomely repay itself. One thing much against cattle grazing on grass land is that they destroy more than they eat. Then the question presents itself—if it does not pay better to cut the grass off such lands, that is, place against the immense quantity of grass trodden down, the cost of labor not only in cutting the grass for fodder, but also expense incurred in the attention paid to the cleanliness of the stable and feeding by hand. The answer can be readily given: it *does* pay better, *and there is no doubt of it whatever*. The increase in milk is so much greater. The reader can easily find this out by getting any ordinary common native cow, which probably gives little more milk than a goat, and find what milk she gives when he first gets her; then confine her to a proper stall, hand-feed her, *and treat her kindly*, and only allow her to be walked to

water and back, or taken out for a little fresh air morning and evening, and he will probably find the quantity of milk at least one-third more than it used to be, and not only that, the quality too is infinitely richer. Now, it is not meant that the increase will be so very great in all instances, but it will warrant his giving the preference by a long margin to hand-feeding ; or at least not allowing cattle to graze over pasture lands, any way and any how, as is generally the case in India.

A water-course through pasture lands is a great boon, as by some little ingenuity it can be irrigated at a small cost, but particular care must be taken in irrigating that no water lodges and lays on any land, as that is a fruitful cause of diseases of the blood poisoning description.

Seeds of mixed grasses for pasture to be sown can easily be obtained direct from England or through the Agricultural and Horticultural Society of India, or Messrs. Stanley, Price & Co., Lindsay Street, Calcutta, or other seedsmen. This firm is recommended because the writer knows they deal with the best houses for seeds generally, both for horticulture and agriculture in England and on the Continent, as well as America.

“ *Doob* ” grass, or the ordinary native grass of India, is, when properly cared for, a very good grass for grazing cattle, as it is fairly nutritive, and stands a good deal of trampling and rough usage. It must not, how-

ever, be allowed to grow rank, as it is then apt to cause surfeit and purging.

According to the common term of "dairy-farming," in England a cow is allowed to graze as long as she can do so in the field, that is, from May to November; then she is either entirely confined and hand-fed, or partially so: it is generally acknowledged now that this is not a satisfactory mode, because the variability of the climate affects the quantity of milk, moreover, more food is trampled down than eaten, and because in the summer months the cows cannot eat for several hours of the day owing to being teased by the heat and flies; and lastly, because so much value is lost in manure. I beg the Indian reader will take note of these points. Here the heat is greater, and there are more flies to trouble cattle than in England. The rains are severe, and certainly do great injury to both grown cattle and calves. Cheapness in one sense, and an entire disregard for the consequences, are all that can be seen as the points of this system, which is worse as practiced in this country than in England.

Another point is, cattle in this country have a bad habit of eating human offal; why it should be so, is both curious and extremely offensive. The less said on the subject the better, yet the reader's *particular* attention should be drawn to it. Cattle fed on poor grass naturally long for some heat-giving substance, such as peas, beans, gram, or other cereals, as we find badly conditioned animals are almost exclusively addicted to this offensive habit.

Thus, it will be seen here that cattle require much more attention than ordinary grazing can bestow, and no doubt India may now find by degrees, as diseases are more traced to the consumption of bad food and milk, that less will be purchased from the bazaar or such questionable sources: that families who can, will keep their own cows, to which subject some attention will now be given, as a great deal of what has been already written relates to the dairy-farm as a public enterprise.

The system of grazing has been much superseded by that of "soiling," which is referred to further on; but a little may here be added as special instructions for people who keep their own cattle for family use.

THE COW GRAZED

FOR

SMALL HOUSEHOLD PURPOSES.



CHAPTER III.

YOUR cow, if grazed all day, must have a hardy constitution, and therefore should be of some of the commoner breeds,—Bengali or country Hansi or Hissar bred cows are less hardy and cannot be recommended for grazing all day long. If they are so treated they will be found to suffer more or less, according to their individual constitutions. More delicate again are the Nagourie cattle and English breeds. These latter breeds from up country and imported animals are all best kept in their stalls the greater part of the day, and if grazing can be got, they benefit by being taken out for an hour or two both morning and evening; but it must be remembered that in so doing the herdsman, or *goalah*, may draw off some milk, especially if he is well acquainted with the cattle and not new to them; therefore he should be a trustworthy man, especially if the cows are quiet animals, as they should be.

Under the conditions of grazing your cattle, of whatever type they may be, it depends on local circumstances if the pasture has water near it: if it has,

so much the better. It is very necessary that there should be water, and that of a wholesome nature.

It is not at all likely that a private family will lease land for grazing only a few cows; but if there are many, as are sometimes kept for large family establishments, and those who have facilities for so doing, such as planters and other mofussil residents, it is well worth while leasing a small piece of land for the purpose, so as to keep your stock divided and apart from village cattle, which may when there is cow-pox or foot-and-mouth disease prevalent communicate it to your herd; also they will be sure to get a fair share of good grazing, not obtainable under other circumstances, especially if the pasture is not near a village, and therefore less likely to be used as a thoroughfare or for uncleanly purposes.

It is most desirable not only to have your own milk and your own butter, but also your own "ghee," or what is termed French butter; and if you are a generally careful house keeper, you will find it pays to do so.

You have the fresh article, too, in prime condition when you want it, and considering also out of the question of milk and butter that each dish placed on your table requires at least half a chittack of ghee for side dishes generally speaking, and one chittack for your curry, the consumption is pretty large, and you will be able to make a very good saving in that commodity alone.

For stall-fed cattle there are instructions after the next chapter on the "soiling" system, which is nothing more than hand-feeding, buying grass which is cut, and otherwise keeping your cattle in the stall entirely, or almost so, only giving them an airing, which they enjoy, and is necessary to them on account of health. After being grazed, cattle must be fed on certain grain, chaff, brans, &c.; that, too, is alluded to under the head of foods for cattle, and how to prepare them.

THE SOILING SYSTEM.



CHAPTER IV.

THE whole of the food is cut for the cattle, which are sheltered from the hot sun, and the rain and flies, and are well cared for in a stall, carefully fed and kept clean. The soil on the farm is arable. The crops grown on these lands in India would be sugarcane, "*Bajree*," Indian corn, mangolds, peas and beans of sorts, carrots, turnips, cabbage, lucerne, comfry, &c. Such lands employed for these products should be well manured.

Are cattle which are kept in stalls in India generally fed with the produce of such lands as described above? Certainly not! And yet we are surprised that they do not give the quantity of milk they should; yet they give a great deal more than those that are grazed.

What they are generally fed with when kept tied up in stalls or under a shed is simply some ordinary grass and a couple of feeds of chaff and oil cake mixed with water.

That a small Bengal or country cow if properly fed increases its yield of milk by at least one-third is an acknowledged fact which many of the readers of this volume must well know. Some improve more, some less, than others, but all increase their yield greatly, as some country animals, like the superior breeds, are of

better stamp as milk-givers than others, which proves more evident when generous treatment and feeding is allowed.

This system of "soiling" is particularly suitable to India where the heat affects cattle even more than the English and continental winter, though in a different way.

Heat, mosquitoes and flies of sorts tease and annoy cattle beyond measure, which, with poor grazing, adds greatly to the loss in quantity and value of the milk. These annoyances, if not entirely removed, are much modified by this system of "soiling," for a good portion of the year at least, and too much notice cannot be taken of this being a most important point, whether we are dealing with the country breeds or English stock. In fact for the latter it is absolutely necessary; for if they outlive the rough plan of grazing on poor grass and that in insufficient quantity, they speedily degenerate.

To remove these difficulties, I strongly recommend "soiling," because it improves the cattle of this country and keeps imported stock as pure as they can be kept; it also improves and augments the quantity, and what is of great importance, improves the quality of the milk, all these being special points in dairy-farming and of the first importance.

To private people keeping a few cows nothing can be better than this mode; their cattle will, if carefully tended, be much more free from disease than when sent

out grazing, and they run the chance at least of having less milk stolen, as well as that of having purer and better milk. By this I do not mean to say that less attention should be given to the *goalah* or man in charge of the cattle.

Thus a corner in a stable may be devoted to a good cow or two without detriment to other stock kept there, provided scrupulous cleanliness is paid attention to.

Then, too, the native attendant will find it not quite so easy to beat and otherwise maltreat the animals as he would further away,—a habit of viciousness not too highly to be condemned, and one commonly in vogue in India, notwithstanding that the natives consider the cow a sacred animal.

Beating cows is most pernicious; for they do not easily forget it, and hold up their milk, which, even after several attempts, they will not let down, though tempted with food and salt, and by the calf tied beside them.

Repeated beatings are never forgotten, the result being that even good cows are spoilt, permanently so perhaps. I point, too, to the almost hereditary habit of country cows not allowing themselves to be milked without their calf, the result being if a calf by any misfortune dies, the cow cannot be milked at all, or the milk falls off in quantity. This again affects the cow in quantity of milk and length of time of keeping in milk, when she has her next calf. How-

ever curious it may appear to the amateur this is well known, so that every endeavour should be made to prolong the period of keeping her in milk, and all sorts of kindness should be bestowed on her in order to make her give up her milk. However, all these matters pertain to general treatment, and will be more fully pointed out further on.

For dairy-farming too much care and too much attention cannot be thrown away in the judicious selection of the breed of cattle purchased as stock : the neglect of it will lead to certain failure, of which there would have been little fear otherwise.

In each and all breeds of cattle, there are good and bad milkers. *Pure breeds are generally not good milkers, or the best dairy cattle, so far as English stocks are concerned*, so a fairly highly-bred cross should be chosen, if cows of imported breeds are purchased. On the other hand, the bull cannot be too well bred either for cross-bred imported cows, or for obtaining a good cross from Hansi, Nagouri, or Guzrati breeds, as well as the more humble country cattle, all of which turn out valuable stock ; which, crossed again, *but not inbred*, prove hardy good dairy animals and acclimatised good milkers ; while the bullocks of the second and third crosses become more valuable as draught cattle, and those with less imported blood make valuable cattle for the plough, —all repaying the proprietor handsomely, *especially* if not brindled or spotted, to which colors, or admixture of colors, the natives of this country in many parts have an objection.

THE CATTLE "SOILING" SYSTEM
FOR
HOUSEHOLD FAMILY PURPOSES,
AS WELL AS FOR
THE DAIRY-FARM.



CHAPTER V.

IT will be naturally understood that if cattle are not grazed they must have their food in an equally large quantity given to them by hand, that is, placed in the manger and the feeding trough, or what suits the purpose admirable in this country, the "*naud* or *nād*" (a large earthen bowl), which can be better cleaned, either in a shed or the stall. It cannot be recommended to be in an uncovered place, as the animals may be exposed to the inclemency of the weather.

The quality of the food in the stall being quite artificial, it is easily improved at will, and hence, in a reduced quantity, concentrated food, as it may be called, can be given to the beasts, for whom such large quantities are not necessary, and the obtaining of it is not so laborious. A cow feeding on a pasture all day, such pastures too as are in and around towns, cannot get sufficient sustenance, nor can it get sufficient food round about where there are large villages unless the villagers own very few cattle; there is also a like-

lihood of your cattle trespassing and being sent to the "pound," or being maltreated if your cowherd is like most of his class, fond of leaving his cattle to have a chat or smoke with his neighbours. In this case you may have to "pay the piper" in the shape of a fine to the pound, or risk getting your cattle maimed or diseased. Therefore, the soiling system is by far the most preferable for India.

The reader need not be afraid because the English word "soiling" system is used; it is nothing more than ordinary *stall-feeding*. The better class of natives and wealthy natives of India practice it, but Europeans in India turn away with dread from anything European in connection with cattle, not only because it is so much easier to get everything done by a native in a native way, but because nothing European is supposed to suit an Indian or imported cow in India; however, let it be understood this is only an English word, not a new system to India, but an old one that has been practiced, especially with the larger breeds of Indian animals to which it is most suited.

In selecting oil cake, that from rapeseed is good though more heating in its principles than linseed, to which it is inferior in every way, and an admixture of the two is better, less rapeseed perhaps than linseed, say one-third of rape to two-thirds of linseed; to be able to make sure of this they will have to be got separately and mixed at home. This, however, is not such an important point, as long as your

servant, who will probably purchase it, does not deceive you by getting it adulterated with other ingredients in the bazaar.

Oil cake of "*til*" or "*ulsee*" is not so good for cattle, so far, at all events, as its effects in some parts of Bengal is concerned, especially as when used with bran ("*choker*") in any large quantity; it engenders intestinal worms, particularly in some districts, probably owing to some peculiarity of the "*til*" grown in such localities.

Both these ingredients, however, are good milk producers, though not more so than what has been recommended above—linseed and rape mixed with bran.

The following list of different grains and green fodders will give the amateur a large choice to select from to vary his cattle's food when he can obtain them in season. Boiled rice produces poor milk, but is largely used in some districts by natives; it however increases the quantity of milk, when given in a thickish soft mess, the rice water or water it is boiled in not being thrown away, but given with it, and mixed with other ingredients. Gram, "*chenna*," or "*boot*," is fattening; not much of it should be given; it improves the quality of milk, but not the quantity. Wheat, "*gohom*," and barley, "*jow*," are good, especially the latter; they are particularly good for growing cattle and also for milchers. Oats, "*jay*," is heating, and at all events if you are forced to use it, do not give much of it, not more than half a seer mixed with other food grains. "*Kalie*

dall," the writer does not recommend at all; there is something in it that seems to be unsuitable, though natives use it pretty largely, especially in Bengal. Cotton seed is particularly good for milk cows, and improves the quality of milk as well as quantity. Peas, "*mutlar*," like gram, is fattening, but not to the same extent, and is better for milk cows, when obtainable in sufficient quantity, which it can be in most bazaars; it is very good also for fattening calves. Tares, "*karie*," can generally be got in most bazaars, but is better for bullocks, and cannot be conscientiously recommended for milk cows.

Leaves of cabbages and cauliflower, which are grown
 Green Foods. by some and used by all families, are excellent; carrots, turnips, and mangolds, can be sown, and are procurable as far as the two former are concerned, in some bazaars. A small patch of sugar-cane can be planted, and it is always purchasable, as also "*bajra*" and "*gomha*," corns cut before maturity and chopped up and given with mixed cattle food. Lucerne and prickly confrey can be readily grown, and if irrigated, crop over and over again; besides a great variety of agricultural grasses which grow most easily from imported seeds, too numerous to mention in the limited space at disposal.

A mixture for a medium sized cow per day.

Oil cake of rape and linseed in equal quantities	...	1	seer.
Barley chaff, " <i>jow bhoosa</i> ," or wheat chaff which is not	}	1½	seers.
so good, called " <i>gohun bhoosa</i> ," of either			
Barley, " <i>jow</i> "	...	1½	„

Gram, " <i>Boot</i> ," " <i>chenna</i>"	..	...	...	$\frac{1}{2}$ seer.
Linseed, " <i>teese</i>"	..	..	...	$\frac{1}{2}$..
Cotton seed " <i>banga-ka danna</i> " " <i>bonaula</i>"	..	...	...	1 ..
Bran, " <i>choker</i>"	..	...	...	1 $\frac{1}{2}$ seers
Chopped grass or green food	...	...	13 to 14	..
Salt (must not be omitted under any circumstances)	..	...	1 $\frac{1}{2}$ chtk.	

The grains should be coarsely ground.

When the cows are in too fat a condition, gram should not be given, but, as a substitute, a larger quantity of bran. If the milk be poor, increase both cotton seed and bran in quantity. If the animal is in poor condition and eats poorly, lessen the quantity of chaff, "*bhoosa*," and increase the quantity of gram, "*boot*," and bran or "*choker*;" add roots to the mash above described. Let the grain soak for some time with all the ingredients in hot water. Sometimes give it when warm and sometimes cold. Try your cows to see which they prefer. Add the chopped grass or green food afterwards when the food is given: if roots are given they should be steamed and then mashed or cut up small, or they are liable to *choke* the animals. When steamed they are enjoyed most; boiling them is not so good. This should be divided into three feeds, as by breathing on a large quantity of food the cows get disgusted with it, and they will be found to eat much more if small quantities are given at a time. In towns the author has remarked that cattle are supplied with too little green food, which is a great fault, and there is no substance that can replace grass.

It must also be pointed out as most important that one chittack of salt should be given to cows daily with the

above mixture, as directed, but not only that, a salt roller, one of Spratt's, should be fixed in every cow's stall, so that it can be licked by them at pleasure. Black salt or rock salt, "*kala nimuck*," can be got in all bazaars and is very cheap and as good as any; it also aids digestion; it is recommended also to give a little sulphur daily. A large bucket of water should be placed before every cow three times a day, and she should be allowed to drink as much as she likes, when it should be removed; or she should be taken to water instead twice a day (morning and evening), as a certain amount of exercise is absolutely necessary and healthful. Then she should have water given to her in her stall at mid-day to avoid midday sun in hot weather.

Now I must direct the reader's attention specially to the grooming and bathing of cows.

This to *goalahs* seems quite unnecessary, because it is troublesome and gives them extra work: as a rule they are a lazy lot, and shirk any thing which can be set aside.

Bathing is not so necessary in cold as in hot climates, and care too must be taken that for the first two weeks at least after calving a cow should not be bathed; nevertheless she should be brushed down with a comb and brush and attended to just as much so as any horse. Some cows do not like the comb, and a hardish brush only may be used daily, morning and evening, or *at least* once a day. It

Bathing and grooming cows,
beneficial and necessary.

greatly promotes health, and too much importance cannot be attached to it, especially as it tends to keep them free of lice, ticks, &c, which are very prevalent in some districts. A cow in addition to being groomed will benefit by a weekly bath, but that is less important than grooming.

Of all things insist on your *goalah* not beating your animals, which is a source of great harm.

Natives do not milk cows in the same way as European herdsmen and milkmaids; they do it with the finger and thumb, or at most with two fingers and the thumb; so if you have a large milker with large teats it is very probable she will only be half milked at most, which ends in her perhaps having more for her calf than it can consume, and she soon dries, so that your "*Belatee goroo*," or "*Belatee gare*," is no good ("*thik nahi hai, sahib*"). You should get a man who has milked buffaloes, and he will know the way to go about it. Do not be at all alarmed, good reader, because I am going to use two English appellations which apply to milking the cow; they are not innovations beyond the words themselves, for anything new regarding the cow is abjured and dreaded. One way of milking is called "*meveling*," the other "*stripping*."

The two modes of milking, stripping and nieveling.

The former is performed by grasping the teats one in each hand, closing the fingers, beginning with the uppermost first, at the same time gently but forcibly drawing the hands down, turn about. When the stream of milk

thus caused ceases to flow, the grasp is gradually relaxed and the hands quickly sprung upwards to renew the operation, and a fresh stream flows from the udder ; each hand so working in alternate succession causes the sound of the streams so caused to appear as one continued flow.

" *Stripping* " is the native way of milking—with one finger and the thumb ;—it need not be described, as any one may see it performed daily.

If you have a free milker, either of the large country breeds, or imported cattle, be careful to see that you have a man who practises milking—" *nieveling* : " *it cannot be too forcibly impressed on you that such is most important.* The neglect of it will cause your cow's milk to fall off in quantity very soon ; the latter operation, "*stripping*," should only be done at the last, when there is little milk in the udder, and is only practised to take away the last portion of the milk.

The writer would point out that though this subject entered here seems out of place, it is purposely so placed so as not to escape the attention of any casual reader who may glance over the book, having a great deal more to do (as is the common excuse) than read *through* such works.

That mothers should know the quality of milk of different animals respectively, a table is below given which points to their values, but it must be known that some cows give better and richer milk than others : there are few of them exactly alike. Cows grazed or

those that have quantities of grass given to them have yellower colored milk, but that does not say it is richer for all that. Buffalo's milk is very rich, in Bengal at all events, and in malarious districts such as Assam, Cachar, Chittagong, and the Darjeeling plains, it is so well known that even natives partake of it with caution,

Comparative value of milk of different animals and the human being.

knowing it to be so. The human milk is valued as below :—

	Cow's milk,		Goat's milk,		Ass's milk,		Human.	
Casein	...	4·48	...	4·02	...	1·82	...	1·52
Butter	...	3·13	...	3·32	...	0·11	...	3·55
Sugar	...	4·77	...	5·28	...	6·08	...	6·50
Salts	...	0·60	...	0·58	...	0·34	...	0·45
<hr/>								
Solids	...	12·98	...	13·20	..	8·35	...	12·02
Fluids	...	87·02	...	86·80	...	91·65	..	87·98
<hr/>								
		100·00		100·00		100·00		100·00

Goat's milk stands first as the most nourishing, and containing the most solid matter, then comes cow's, ass's and human, in order as placed. Goat's milk is also easily digested. The writer can state that, from personal observation, any one badly affected by spleen in feverish districts is at once attacked by fever if indulging to any extent in buffalo's milk, while that of the cow or goat can be taken beneficially.

THE DAIRY COW HOUSE

CHAPTER VI.

THIS in India must in a measure be different to that employed in England or in cold climates. There they are built to retain heat ; here they require to be constructed to be cool, yet in the winter months to be warm. This can only be accomplished by free ventilation, and the methods that can be adopted are numerous, and both costly and cheap.

“ The size of the building should be arranged with an eye to economy, as well as to the size of the farm, and also so constructed that there be economy in labour, although that is cheaper in India than in England.

Where a mixed system of farming is carried on, granaries will be necessary ; and when a dairy-farm is in the suburbs of any town, or the mofussil, where the daily supply of grain and cake cannot be purchased, it has in consequence to be kept in considerable amount in stock, and a granary or loft is necessary. On extensive farms there will be sheds for cattle, loose boxes for calving cows, piggery, stable, and cart shed.

The site should be near a ready market, or so arranged that the produce can be readily conveyed by road or rail to one.

A good water supply is essential ; indeed absolutely necessary for the stock, as well as for washing down floors, walls, &c.

Farm buildings should be on raised ground, a good mound or hillock giving capital drainage, and next to that, a slope is the best site.

Such situations have the advantage of possessing a good dry floor for the cattle and allowing all rain-water to drain off rapidly. Low-lying lands are unfit for such purposes, and, even with a large outlay, can never be made so healthy ; and the health of the cattle as well as labourers is of the greatest importance, therefore great care should be taken in selecting the site.

Galvanised iron roofing is excellent, but in India the reflected heat of the sun's rays makes it objectionable, unless there is boarding or felt below to allow of a free ventilation of air between the iron and wood or felt, of, say, 4 to 6 inches ; the greater the space the better. The sheds should be airy, and the walls not too low, certainly not less than 8 or 9 feet. A drain should run round the roof to carry off rain-water. The walls may be made of sun-burnt bricks where the soil with which they are made is of a sufficiently hard and plastic nature to make them durable. Yet this sort of structure is not advisable, as it soon gets invaded by rats and destroyed by their burrowing through the walls. "*Kacha-packa*" or burnt-brick fixed with mud is better, but the most to be recommended is a "*packa*" masonry wall.

The buildings being formed in a square, leaving a court-yard in the centre, economises space and labour and forms a fold for the cattle. This is as farm-yards are constructed at home, and such should be the plan too in this country, because it economises labour, and, what is a greater advantage, the yard is less subject to the invasion of wild animals, snakes, and mad dogs.

A thatched roof is as cool as any, but it harbours snakes and vermin, and therefore cannot be recommended; but if used it should have a bamboo mat under it, and over this bamboo to which the thatching is tied. This does not, however, interfere with the ground plan here given, which is as good as any.

In the walls below the eaves of the house two feet of masonry work may be saved by putting in posts sunk in the masonry, leaving that space between the wall and eaves for ventilation. This may be done in some places in the cow shed, or throughout, and over this space may be put a jaffrey work made of painted wood or bamboo. Thus the walls at these places would be six to seven feet high, and over that the jaffrey or trellis work of two or three feet.

Such ventilation could be applied also to the loose boxes for horses, calves' pen, bull house, boar house, and piggery, if included in this plan, and which is quoted from one of the best authorities on the dairy-farm as quite suitable to India. The space with jaffrey-work should be closed up with matting during the cold season.

The labour employed may interfere with a piggery being kept on account of caste prejudices, and may be dispensed with if it cannot be surmounted, or not thought necessary; in that case the space would be used for a cow shed.

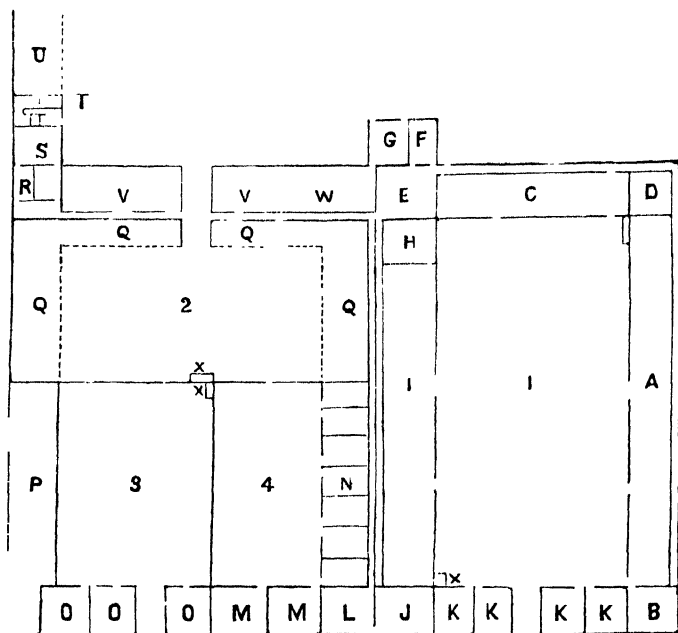


FIG. 1. Plan of Buildings of Farm.

1, 2, 3, 4 yards; A, cow shed; B, calf pen with feeding passage in front, and straw over head; C, cow shed; D, calf pen, with feeding passages in front and corn and oil cake granary above; E, food mixing room; F, house containing water tank (and furnaces if roots are boiled in this country); G, root house; H, calf pen; I, cow shed; J, calf rearing house; K, K, K, K, houses for calving cows; L, pig feeding house, containing furnace if necessary; M, M, houses for

farrowing sows ; N, pig sties, with covered feeding passage ; O, O, O, loose boxes for horses ; P, stable ; Q, pen shed ; R, bull house, with corn granary above it, and the open shed adjoining it ; S, yard for bulls ; T, boar house ; U, cart shed ; V, V, V, barn with threshing floor in centre ; W, chaff house ; X, water troughs.

All these are necessary buildings on a mixed farm, and a treasure to the proprietor, rendering farming occupation as pleasant as it really should be to those who make it a hobby, or carry it on as a source of profit. The yard marked " I " should be exclusively used for dairy cows, which may be injured by the other stock. Yards 2, 3 and 4 can then be given to the use of horses and pigs.

The interior of the building must now occupy our attention, especially that which applies to dairy cattle, boxes, stalls, or the byre are what are generally used for milk cattle, each of these names implying one and the same thing, much like a loose box for a horse

These should be constructed of planking and posts at the four corners, with the feeding passage at the head as a convenience of carrying food to the cattle and obviating the chances of a kick from some startled or vicious animal. There may be two rows of these stalls with a passage at the head of each for feeding the cattle, and also a passage between the two lines of stalls to clean up the shed. Each stall should be 5' 9" long and 4' broad, with the divisions between not less than 4 feet high. Between the rows of stalls there should not be a less distance than 5' 9". The two feeding passages at the head of the stalls would be 3' 6" in

width : one passage at the head of each row of boxes.

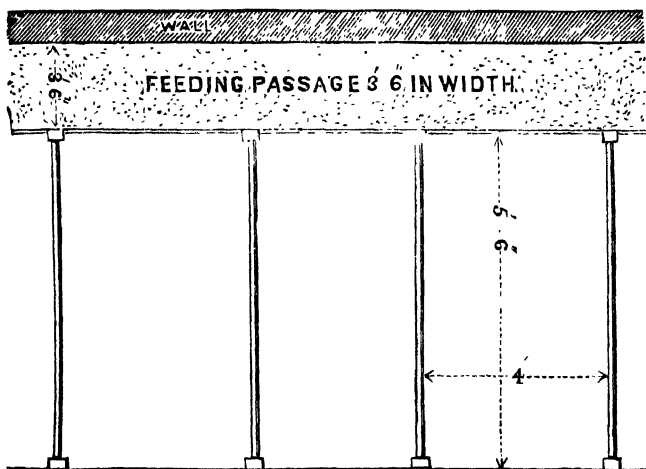


FIG. 2 GROUND PLAN.

A manger should be at the head of each stall close to the ground, as it is not beneficial for the cattle to raise their heads high when feeding. Of the height of these a difference of opinion prevails : some authorities say they should be quite on the ground, while others consider they should be 2 feet high. The greatest objection that can be shewn to the manger being raised is that when the cow is lying down it cannot eat. It should be, however, not far from the ground, so that when the cattle are laying down they can eat ; sufficient space should be left between the manger and the ground to allow for cleaning.

Families who keep cows for household purposes will not probably keep other stock except bovines ; and

caste prejudices may even prevent a dairy-farmer keeping pigs under the same structure as his cows; in such a case, a modification of the plan of a dairy cow house may be here annexed with advantage. In all cases the floor should be either made of "*pacca*" or Portland cement, so as to be easily cleaned, and a drain should run round the eaves of the roof; there should be sloping floors to the back of the stall, and the slope there should meet a drain to carry away all urine and water used for washing the floors.

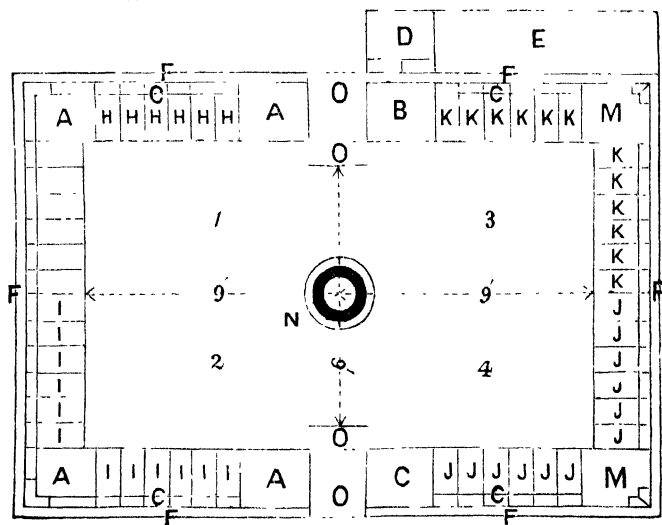


FIG. 3.

A, A, A, A, store rooms; B, food preparing room; C, milk room; D, bull house; F, yard for bull; F, feeding passages for bull, cow and calf houses: iron fencing separating yards, 1 for calves, 2 for dry cows, 3 for milk cows, 4 for cows in calf; G, feeding troughs; H, stalls for calves; I, stalls for dry cows; J, stalls for milk cows; K, stalls for cows in calf; M, M, calving rooms for cows; N, cistern with water trough all round below it for cattle to drink from.

The size of such a building should be regulated by the number of cattle that may be intended to be kept, but the size of the stalls must remain the same as formerly directed, that is, 4' x 5" and the feeding passage behind it 3 feet 6 inches. The construction would be as it were four buildings all joined, with one large court-yard in the centre divided with good strong galvanized wire fencing into four divisions, in the centre of which in each case there might be a small temporary roof built up in the monsoons to shelter the cattle when unable to be taken out in inclement weather. Under the wire fencing should be a drain to convey away all water from the court-yard. The cistern in the centre with a galvanized iron trough below and all round it so that all the cattle can get to it will be found a great convenience, both for watering the cattle and for supplying water for washing down the floors. The one feeding passage F does for both the bull house and main building. E, the yard for the bull, may be walled all round or surrounded with strongest wire fencing. All doors should be on the sliding plan, either on wheels below, or wheels running on an iron bar above, which saves accidents from doors banging and which often alarm cattle. The wheels run on an iron bar in either case, and on each side of the door are two small battens of wood to keep it from being dislodged from its position, while the wheels are also grooved to keep them from slipping off the iron bar.

The house may be built with walls up to the roof or with a jaffrey work for two or three feet on the top,

fixed to posts sunk in the walls, as recommended in the first structure.

Should there be jaffery work or galvanised iron meshing on the top of the walls, mats must be placed over it in the cold season to keep out the cold, as a certain degree of warmth is necessary to keep the cattle in condition, and cold makes them miserable, and they fret and lose in condition from want of rest during the cold nights of an Indian winter.

The most approved method of tying cattle in their stalls is by a chain to one or both posts at the head of the stall which has an iron rod on it, over which one end of the chain is dropped, with a ring at that end to slide up and down the rod. The other end of the chain or chains, if two are used, branching into two parts, fastens round the animal's neck with a spring.

Another plan is to have a bar running above all the stalls from which chains are suspended, of sufficient length to allow the animals to lie down or move their head from one end of the manger to the other, the lower end of the chain being fastened to the horns. These chains are easily fixed on, as they hang within reach, and the animals are speedily secured.

The floor of the entire house, including the stalls, should be of masonry, with a good drain at the foot of the row of stalls, to which drain both the stalls and passage to enter them should slope. Floorings may be boarded, but as wood is very perishable in this country, it is not recommended. Wooden floorings

are more used in England, because they save litter for the cows to lay on, and are warmer.

In towns or the suburbs, a water-supply can easily be carried to the head of each stall, but it is decidedly better that the cows be taken out to water, or at least be taken out for a certain amount of exercise equivalent to it.

There remains the houses for calving cows, which have to be dealt with ; they should be roomy with the cow's stall in one corner. Calf pens should be next to the cow sheds if it can be so.

CATTLE HOUSES.

CATTLE to be fattened may be placed in stalls, such as are recommended for dairy cattle, or kept in sheds divided off in stalls arranged much in the same way, separate from the dairy animals. Store cattle are kept in folds which have sheds, in which the animals can seek shelter from rain or sun. Cattle houses are erected on much the same principle as shewn for dairy cattle, with its row of stalls and feeding passages, or, as they are sometimes built, with a feeding passage between two rows of stalls ; in this case loose boxes, each being 9 feet broad by 10 feet long, at the back of which is a box sunk below the level of the stall to sweep the manure into, which should be removed daily, as if it is allowed to remain and accumulate it would impregnate the atmosphere and become obnoxious, besides tending to engender disease. If such cleanliness is observed, the stall system is an economical one, and a good mode of fat-

tening cattle, which must not be taken to water, or leave the stall from the time they are placed in it, till being taken to the slaughter house or to be slaughtered.

Each stall must have a trough fitted at its head divided into two divisions—one for water and one for food.

The bull house should be placed some way from the cow sheds, with a small yard next to it ; and should there be reason for keeping more bulls than one, there must be a strong partition in the bull house, as well as in the yard, to which one each must be allotted.

Cake, corn (roots if any) and straw or chaff should be kept in lofts.

It is best that all doors should be made, not on hinges, but to slide by means of rollers, on an iron bar either above or below the door ; this does not take up room in opening and shutting, and prevents their banging, as well as obviating the difficulty of closing or opening during windy weather.

These doors will be found a great convenience in comparison to the ordinary way of putting them up, and will sometimes prevent accidents of a serious nature.

The above remarks conclude this part of the book on buildings, but one word more is necessary regarding lofts : the floors of these should be boarded, not as is often the case floored with bamboos, which, should there be any vermin, such as snakes, harboured above, admits of them dropping on to the cattle.

All this great care may seem very ridiculous to some, but snakes are often carried to most unlikely places in grass, chaff, and even grain, which they enter unseen. Too much care cannot be taken to avoid loss of perhaps, most valuable cattle, which cannot be replaced at once, and at all times at great expense.

Every corner of the buildings should be carefully cleaned at least twice daily.

BUILDINGS FOR A FEW COWS KEPT FOR FAMILIES.

ONE or two cows can be conveniently kept in a stable, even if they are not grazed during the day, when there is sufficient stable accommodation, but in all cases care should be taken that the cow be kept just as carefully groomed as the horse, and free from vermin and flies, which cause them equal annoyance.

Indeed, it is marvellous that so many families occupying spacious grounds, with lots of out-houses and stables, any of which would suit the purpose, do not take the trouble to keep two or more cows; the housing of which at least would cost nothing, and insure them getting pure unadulterated milk. The little attention involved is far too small to be considered in comparison to the advantages, and indeed might fill up a lady's spare time far more pleasantly than many other pastimes.

Even an out-house will do, but these as well as the stables should have a stall such as described in Fig. 7, page 38, with a good slope to the entrance of it to

convey away all water in a drain, which must be kept pure to prevent smell, and also that your cows may be clean. There is nothing particularly necessary in a house for a few cows different from an ordinary out-house, but the floor should be masonry, or a bad smell will arise from the ground getting saturated. It should be well ventilated, as the cow, like all animals, enjoys fresh air; but barred windows and gaps of such description should be provided with mat *jhafs* or doors in the cold season to keep the place warm. The level of the floor should be as below: even should there be no

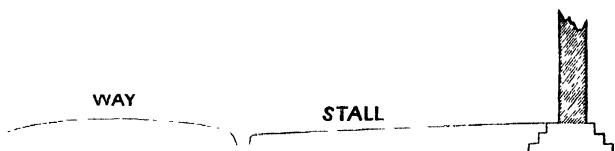


FIG. 4.

stall, the slope and drain should be made.

Have a *nad* of native construction, a large earthenware bowl, fixed in the earth in one corner of the stall. If you have not much room at the door of the out-house or stable, or it be inconvenient to have one there also, you could do without it, but it is nice for the cow in the cold or hot weather mornings and evenings to have her food there and enjoy the fresh air and sun.

Mosquitoes and flies worry cows terribly, and cause the cow to fret and be bad tempered, or more correctly, to be restive. When being milked they particularly give annoyance in milking by causing the cow to kick and move about just when she should stand still.

If you have a stall, have an iron bar fitted up at the corner with a ring which can slide up and down on it to fix a chain on to. The chain should branch so as to fix round the cow's neck with a spring, like that on any ordinary dog's chain. If you have no stall, fix a post in the ground, to which add the iron with ring and chain as above described and shewn below :—

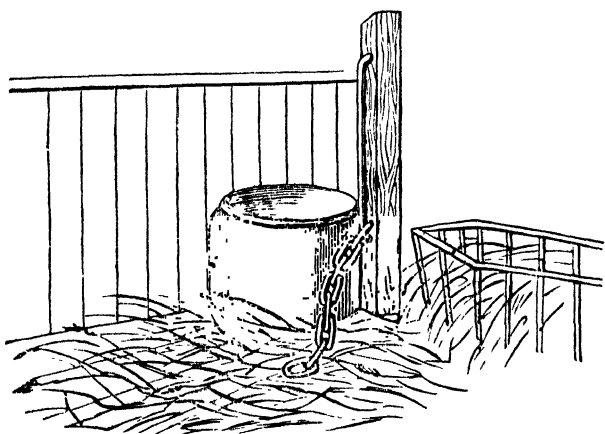


FIG 5.

The *nad* being at one corner of the stall, a manger for grass should be quite near it, and the chain long enough to reach both manger and *nad*, or feeding trough. Certainly if you do not care to go to the expense of getting a chain, a good rope will do. The manger should be raised just off the ground. Straw or grass may be thrown before the cow, and a manger is not absolutely necessary, but much will be trodden on and spoilt : so in places where one has to buy grass, it will be wisest to have a manger.

The above described are all the fittings for a cow shed, much of which can be dispensed with if thought too expensive ; but to have them is a convenience and it is more ship-shape and workmanlike.

When you have these, your *goalah* will appreciate the convenience and see the use of them ; but if asked about them, he will consider them quite unnecessary adjuncts, barring the *nad*, and the flat floor ali around with as much filth sinking into it as would drive most English farmers distracted, not only at the excess, but at the loss of the manure, which would be of so much value. The manure thus got will be valuable for your garden. Bear in mind, the more comfortable you make your cow, so much better the chances of your getting lots of milk from her.

DAIRY CATTLE MANAGEMENT.

THE STOCK.



CHAPTER VII.

ON the size of the farm depends what stock will be necessary ; and our remarks will be confined to dairy cattle, as it is strictly dairy farming to which allusion is made here. If there be also a mixed system of farming, other than dairy cattle will be necessary.

Sheep should not be kept on a dairy-farm, as they eat the very heart out of grass and all the tender tips of such creeping grass as *Doob* or *Dub* grass.

In England two acres of good land will yield sufficient food for a cow, or three acres of poor soil ; that is for an English cow of the short-horn breed, which is one of the largest consumers of food. In this country this would yield sufficient food for a cow and a half, or two cows of the Bengal small breeds, or one of the Hansee or Guzrati breeds, considering the soil not so productive as at home. Also it must be considered that the food being more rank or full of water, a larger quantity of it will be consumed in proportion to grasses and foods as used in England which are more nutritive. It is not asserted that more cattle could not be kept on this area

of land, as it is done every day by native *goalahs* ; but it is to be condemned, as the cattle are only half fed and cannot pick up more than a bare sustenance.

In stocking it must also be remembered that India is a wide word ; that the yield of grass and fodder is controlled to a great extent by the climate and fertility, and that both of these differ as vastly as India itself is large in comparison to the British Islands ; so no hard and fast rule can be put down, nor can there be in England where they speak and write *approximately* on the subject, even though the space written of is much more proscribed or limited. The size of cattle, too, has to be considered ; different breeds vary as regards the quantity of food they consume.

Some calves will have to be purchased to take the place of cows that have died or been removed or turned barren.

Such calves as are purchased should be of a superior stamp and breed ; these cannot be got readily in India. They are not generally taken round for sale, but may be purchased at fairs up-country and elsewhere, or you will have to visit places where they are bred, and buy them.

Small cattle are little good on a dairy farm ; they *must* be animals giving large quantities of milk, and be large animals, for which the butcher will pay well, or such as you will be able to fatten for the market yourself.

Small cattle not desirable.

Short-horn cattle are the largest breed and most favourite animals to cross with, and are to be recommended so far at least that a bull should be kept of that breed to cross Nagouric, Hansee, and Guzrati cows, and improve the home-bred dairy stock kept. If English cross-bred (imported) cows are kept, a breed between short-horns and Ayrshires are large milkers of good size. Pure-bred cattle are not such good milkers as cross-breeds, and when purchasing from Europeans you should have every facility offered to you, whatever sort of cow you purchase, to see her milked several times before you are satisfied. Alderney cows give the richest milk, and though they are not large cows as considered among English cattle, they are of very good size, and what is more they stand heat better than most English breeds.

At the set off there are great risks in purchasing cows that are quite unknown to you.

Nagourie cows, Hansee or Hissar cows are as good milkers as there are in India, and also Guzrati cows which are less known in Bengal because they seldom find their way there. All the same, let it be remarked, these breeds are more or less leggy animals, and the squattest and broadest of them should be selected with a view of inter-breeding with an English bull, from the short-horn breed. Not unfrequently these squat cows are the best milchers, though not always so. Country or small Bengal cows cannot be recommended for dairy purposes, for it must be remembered that three fairly good

animals of this class would not give more milk, or perhaps so much as one good Hansee cow.

There is much to be thought of in this point—the selection of cows; because on this depends the profit of the farm, if carefully managed after they are purchased.

There has been remarked by a Frenchman who had a great deal to do with stock, that above the udder of the cow there is a slight fringe caused by the junction of hair which points upwards with that which grows downwards towards it, that on examining a number of cows, those that had this widest and broadest, were the best milchers, and that this is also to be seen in bulls who produce the best stock for milk. This applies to India also, though sometimes a cow which is a good milker is not so marked.

Cows should be bought that are not by any means aged. Three-year-old heifers are the best probably both in this country as in England. A good way of ascertaining the age of a cow is by its horns; at three years old there is a ring marked at the root of the horn, which is pushed up and followed every year afterwards by another ring. Her horns being smooth without many rings she may be considered young; but if the horn is dressed and there are few rings, the great smoothness will draw attention, and the fraud can be detected by an experienced eye. The teeth, too, indicate the age, and probably this is the best way of ascertaining the age of cattle.

At two years old there are two central teeth, which take the place of two of the eight teeth the calf was possessed of from the age of one month, and each year two more, till all eight permanent incisors will have taken the place of the milk teeth, as they are called, and which can easily be recognised, the milk-teeth being so much smaller. Then as the animal ages, the permanent teeth wear away and separate, leaving gaps between each other, more or less as the case may be.

At four years old all eight incisors have usually appeared.

It is remarkable that the best looking cow is not always the best milk-giving animal, nor has colour much to do with the quality or quantity of milk; but a white cow is objectionable, because it shows the dirt so much more, and somehow these cows are most infested with lice, and often give poor milk.

Also an irritable cow is generally not more than a moderate milker, besides giving trouble, not unfrequently upsetting the milk vessel.

Good milkers seldom are fat or carry much flesh. Care should be taken to see the teats are far apart and the udder large and soft, and that each teat has a good milk passage; as some teats are defective from inflammation, injury or defect of birth, and no milk can be drawn.

This is not uncommon at all in this country, indeed far more prevalent than in England.

There is no English book that will help you at all with your selection of a cow in India, nor will your English knowledge of farming help you ; you will have to buy your experience if you have no friend in the country with an Indian experience of cows. As before said, the udders must be large and soft, teats large and well developed, and not blind, that is to say, with a hole in each of them, and that, too, developed. Not unfrequently there are large veins on both sides of the belly near the udder, and even on the sides of the udder which are large and prominent. The tail should be thin, and with a bushy full bunch of silky long hair. Rump thinish, even though the hams may be full.

Not unfrequently some cows have horns growing out at right angles to the head, either pointing forwards or sideways, but these cows not unfrequently give a good quantity of milk, and are called on account of this sometimes unsightly peculiarity by the natives *Mynee*. More frequently the horns of a good milker point backwards than forwards. The head should be small and lean ; neck thin, not broad ; loins broad and body large and long, with a loose skin, or such as is easily grasped.

Largeness and smallness of bone depend on difference of breed, but select the biggest-boned animals in preference of each breed to small-boned beasts.

Short-legged cows are better than stilted long-legged creatures. Hansee cows are often so, select the shortest legged. The peculiarity is often a defect of the breed,

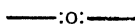
as also of Nagourie cows ; less frequently so with the latter animals.

Never buy an old cow, *unless you get her very cheap*. At most, do not purchase a cow more than seven or eight years old, though with care she may give several calves after that age, but cannot be depended on to do so. She may die suddenly while calving, or refuse to bear again or at very long intervals. Most *natives think her practically worth nothing* after eight years ; but as she will be much better fed and cared for in your possession, she *may* give many a calf after that age has been attained.

BREEDS OF CATTLE

AND THE

BREEDING OF CATTLE.



CHAPTER VIII.

OF the Indian breeds of cattle not much can be said, as each district has more or less the ordinary country animal in a better or worse form as regards size and milk-giving qualities. For instance, in Calcutta there is the small Bengali cow, such as is common over a great portion of lower Bengal, an animal not much larger than a good-sized goat,—*some* of them not giving more milk than the latter animal.

Some of these small Bengali cows, however, give a wonderful quantity of milk for their size ; this is not generally the rule, but the exception, the larger number being worthless except to the native *goalah* who keeps a few to make a bare livelihood. These are not cattle fit for the dairy by any means, as it will be readily seen what an immense number of them would have to be kept to produce a sufficient quantity of milk to be a profitable yield ; whereas each cow would require the same attention as a larger and more milk-giving animal, though requiring less food, and esti-

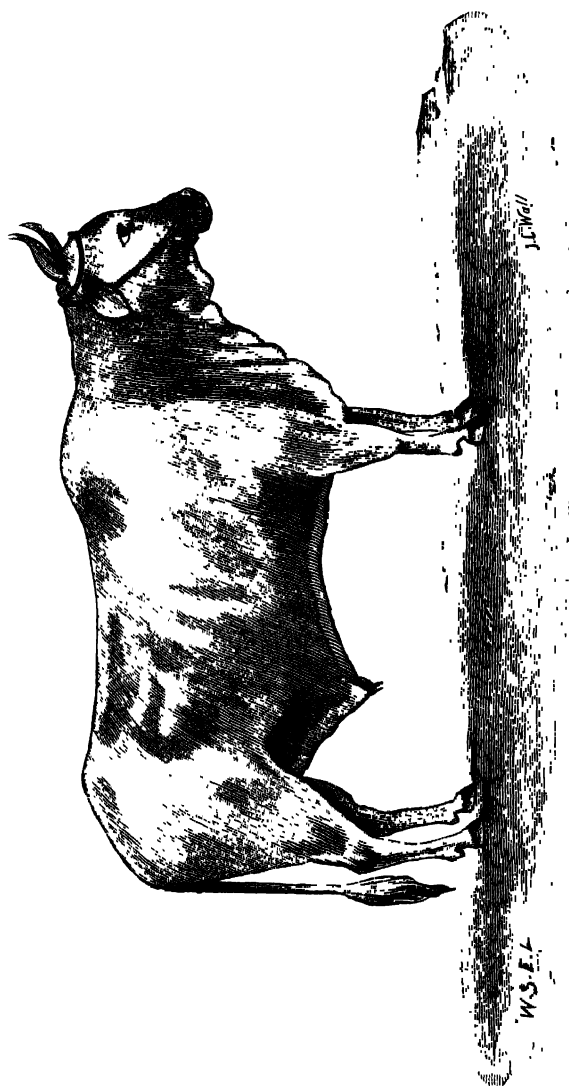
inating that three of these small animals would give as much milk as one fairly good Hansee, there is little question but that they would eat considerably more.

As the country cow is seen further up-country, it improves in size and general appearance, though not perhaps in the same ratio as regards quantity of milk, unless there be an occasional admixture of the Hansi, Nagourie, or Guzrati breeds.

There seems no distinct breed beyond what may be called the Lower Bengal cow and the country cow, which is considerably larger ; they verge from one to the other in size. Neither of these are fit for the dairy, unless perhaps they be quite an exception to the rule ; but these cattle crossed with an Ayrshire or Alderney bull produce good stock. They themselves cannot be recommended in any degree.

This would be probably the best plan of passing over the great difficulty of getting truly good stock for dairy-farm purposes, from what there is in hand in Bengal.

But what would be probably quicker, as well as more profitable, would be to purchase good Hansi or Nagourie cows, crossing them with a good short-horn bull. These would make a suitable cross, whereas it is recommended that Ayrshire or Alderney bulls should be crossed with Bengal and country cows, as they are of smaller and more suitable proportions, and because the one breed is a plentiful giver of milk, while the other is noted for the richness of its milk ; and though not giving the large



HALF-BREED SHORT-HORN.

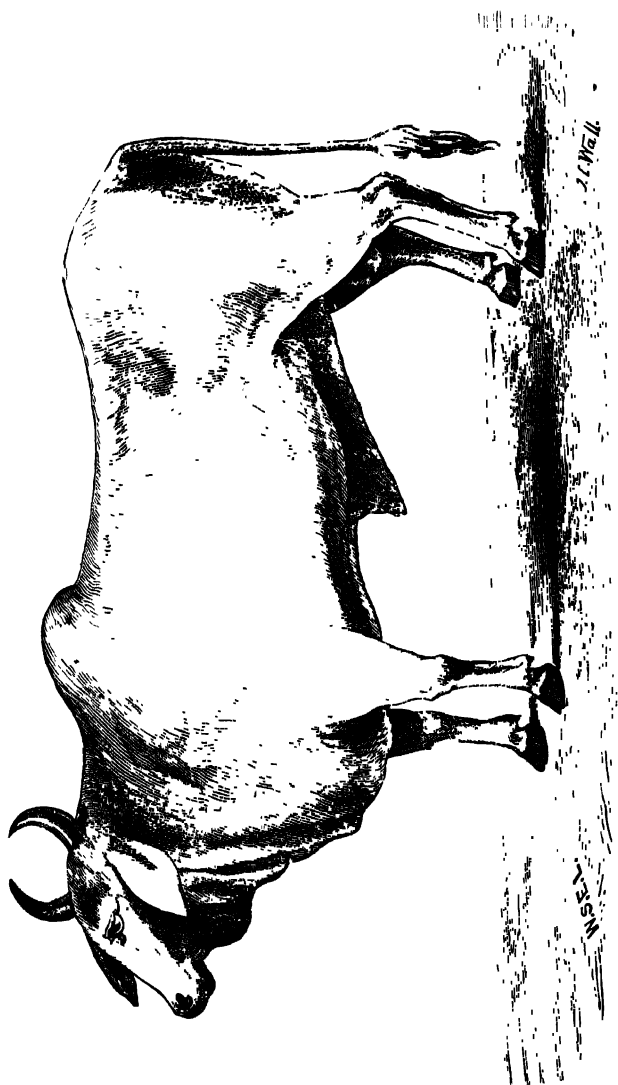
quantity some imported breeds do, yet the same is far in advance of what a country or Bengali cow would give.

Some very good cross-bred country cows can be got occasionally in Calcutta and in mofussil stations, but that is seldom, and any one starting a dairy-farm would have to pick them up at auction, or through private purchase from time to time: whereas Hansi cattle can be got from dealers, natives who bring them down-country in large numbers, or by going up-country and making the purchase on the spot, which would be far the better plan of the two.

The difficulty in India in starting a dairy is to get suitable cattle to commence with, and nothing better can be got in any numbers than Hansi, Guzrati, Nellore, Nagourie, or Goorgari cattle, which are the best breeds in India. There is also a mixed breed of cattle that are very good in Darjeeling, but if used as ordinary cattle are by natives, they would not stand the heat of the plains. There are also the Mysore cattle that are fairly good, but they are not large milkers.

To describe first of all the Hissar or Hansi cattle which are useful. The HANSI or HISSAR breed are of large size generally, though the author has seen some very undersized cows of this breed giving large quantities of milk. They have a short neck, but carry their head erect, have a large high hump, and have high hind quarters.

Their tail is long and with a bushy tuft of long hair of rather fine texture. Their head is broad, and ears of



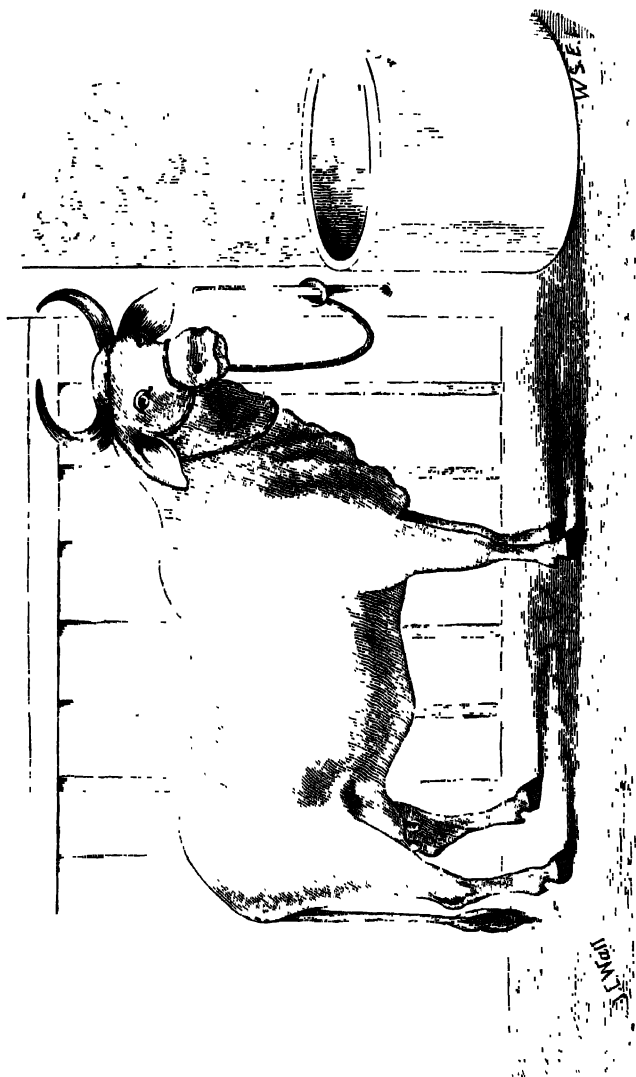
HISSAR BULL.

moderately large size, and their horns are generally long and curved, the ends tapering and inclining inwards to each other at the points and backwards, though it is not uncommon to see them of different forms. Their bodies are bulky and generally long, but very different in shape to that of English breeds, which are rounder and broader over the back. Yet these cattle have broad chests, stand with their legs well apart, and have a very handsome appearance. Their hind-quarters are usually high. The most common colour is whitish, sometimes red, brown, or black, and in some rare cases piebald.

Probably this is the finest and handsomest breed of cattle in India, and in the author's opinion they are fairly hardy. The bullocks are notably good as cattle for drawing heavy weights in carts.

Prices of cattle vary very much, but as a rule you may consider you have made *an* *ordinary bargain* in the purchase of any breed of cow when paying at the rate of Rs. 10 for every seer of milk the cow gives at an average daily. Of course, if you purchased a cow where the breed she is of is much cultivated, you would get her cheaper ; but according to her milk-giving qualities so would be her price. The price mentioned would be thus calculated for a cow that has had her first or second calf ; after that there should be some reduction allowed.

Also the further up-country you purchase a cow of this class, the nearer Hansi or Hissar you are, and the cheaper you will get her. What is stated here



HISSAR COW.

applies to all the different breeds of cattle in purchasing them from vendors who take them to Lower Bengal for sale; they would be valued on an average of Rs. 10 per seer on reaching Calcutta, and the higher up-country you went there would be some reduction in price; also you would pay something less for a cow after she had had her third calf.

But do not depend on your servant to make the purchase, as he would buy a worse cow for you on the consideration of getting a larger sum of "*dustori*" from the vendor, which matter is easily settled with them, not generally in words, but by some secret signs that are understood among up-country dealers, by holding each other's hands, and at this up-country servants and dealers are dexterous.

While the European Master is probably thinking his servant is driving a long and hard bargain, he is consulting the seller what "*dustori*" he would get.

This breed of cow gives from 6 to 16 seers of milk in their own country, but falls off somewhat in Bengal.

The GUZRATI or KATTYWAR breed much resemble the Hansi or Hissar breed, but differs in the respect that they are larger-boned and more heavy-looking, with long and larger pendulous ears; have less of a hump, and generally shorter horns.

Very few true Guzrati cattle find their way to Lower Bengal: those that are passed off as such are of the Hansi breed, to which they are quite equal, and these as well as the Hansi cows yield from 6 to 16 or 17 seers

of milk in their own country, or up-country, but there is a decided falling off when brought to Lower Bengal, where a cow that once gave 16 seers would give not more than 12 seers, or perhaps less. In constitution they are much the same and fairly hardy, though the author has had less experience of them than of the Hansi or Hissar breed, which he does not consider in any way delicate, unless exposed to cold and heavy rain.

During the cold season at night, these two breeds of cattle, and also Nagourie cattle, benefit much by having a blanket laid over their back. This is very necessary in the warmer climate of Bengal, and they certainly cannot well be dispensed with up-country.

NAGOURIE CATTLE are a breed which originated in Nagpore, but they are found now, probably of the purest origin, in and round about the locality of Delhi and the North-West Provinces. They are tall, lightly-built cattle; that is to say, they are not broad-built, but have deep flat bodies, narrow head, long and curved rather light thin horns, with a bump between them, and thin, long, switch-like tail, with a good, thick bunch of luxuriant soft hair at the end of it.

Their colour is almost always of a bluish white or grey, if of pure breed, which is difficult to be got nowadays, as of late years they have been much mixed with other breeds.

This is the great fast-trotting breed so much prized formerly (and now too, when they can be got of pure breed). They cannot draw heavy weights, having long



GUZERATI BULL.—(*From a photograph.*)

hoofs and long pasterns, and are, therefore, much used by wealthy natives for drawing *ekkas* on account of their great speed in trotting. They are harnessed to the conveyance by means of a pole which is so tilted up as not to throw much weight on the cattle.

These are very handsome cattle, but they are very delicate, and comparatively expensive, because they are not easily obtainable of pure breed, and though they are excellent milkers, it is questionable if they produce more or even as much milk as the generality of Hansi cows. They have high narrow humps, and both sexes have the appearance of lightness and activity

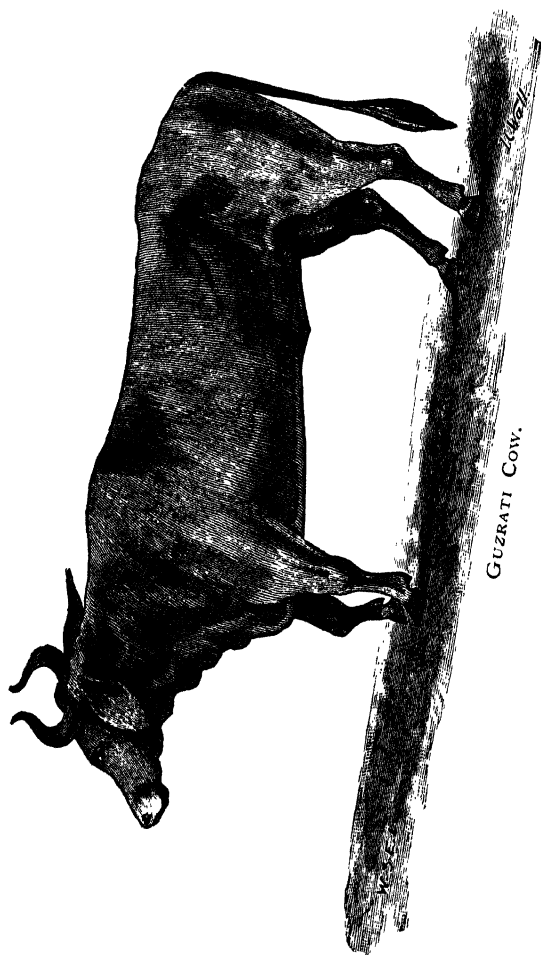
The NELLORE breed of cattle come from the Madras Presidency, are of large stature, with small horns often pointed outwards and blunt. They are short necked, but carry their head erect, and are of stately bearing and fine-looking animals. Their head is short and broad, eye black, dull, and giving the animal a sleepy appearance.

The muzzle is broad, and ears large and pendant. The tail short, and the hump large, often inclining to the side. The body of these animals is short and broad, back straight, and hair of fine texture and short.

They have a particularly heavy pendant dewlap, and a solid appearance altogether.

They are almost always white, or whitish, inclining to grey, the exception being red.

The cows are good milk-givers, and bullocks are much prized as draught cattle. This breed of cattle are



expensive to purchase even in Madras, and, of course, more so when brought to Bengal.

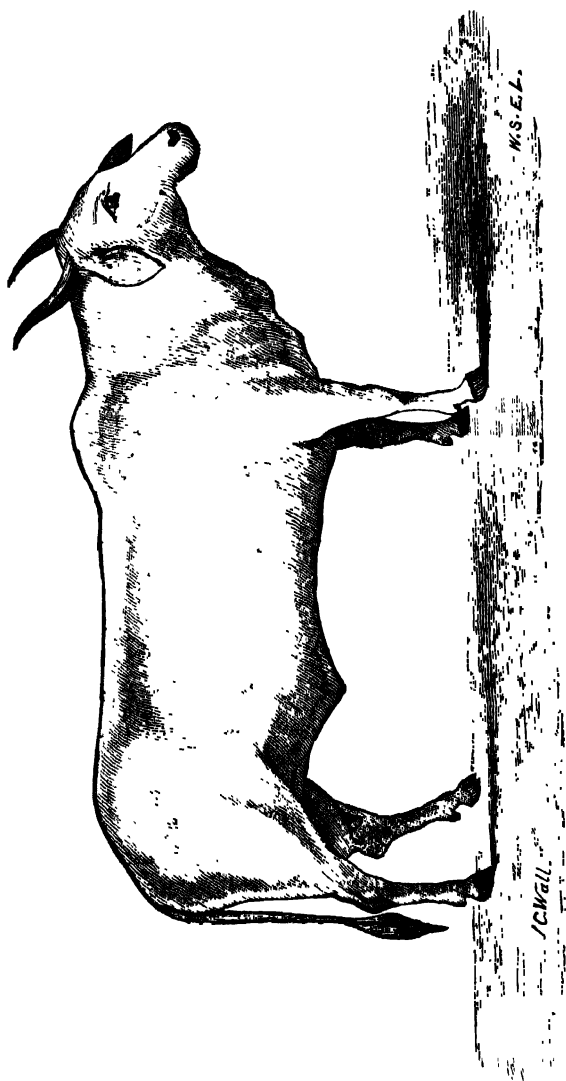
They are almost or quite as good milchers as Hansi cattle, and are hardier, but more expensive.

GOORGARIA cattle are natives of the Mooltan district, and are generally of medium size or a little over. They are very strongly built and handsome animals. They are generally of a dark colour, with black points, and medium sized horns. They are excellent milkers, and have a good strong constitution like the Madras cattle, but give less milk. They are cheap in Mooltan, but cost much the same as Hansi cows when brought for sale, which is seldom.

There are also the MYSORE cattle, which only deserve a passing notice, as they are not good milkers ; but the bullocks are considered very hardy and good draught cattle, as also they are quick walkers. These are fairly large sized animals with large horns, often three feet in length, strongly built, broad chested and backed ; they are excellent bullocks.

BENGAL cattle are well known as being of a very mixed type of animal. What the author would call the *true* Bengali breed are the smallest of all, except the Gainasor, the miniature cattle of India, the difference being as marked as between the other good breeds of cattle and the Bengal breed.

Diminutive as the true Bengali cow is, *some of them* give as much as three or three and a half seers of milk ; but the majority do not yield more than one to one



NELLORE COW.

and a half seer per day, as they are treated in their native homes and only fed on such grass as they can pick up at the village surroundings and road sides, and never treated to grain of any sort.

As one moves up-country from Lower Bengal, the cattle improve in size, not so much, however, in milk-giving qualities as one would imagine they would on this account.

However small the Bengal cow is, she is well proportioned in limb, has a small head, with broad forehead in proportion, and small in-curved horns, their points being curved forwards slightly, and if anything the body is inclined to be long and low, on short legs. The best and typical class of Bengali cow is referred to in these remarks. She has a long tail with a good bushy bush of fine hair on it, and her coat is fine and glossy if well groomed.

IMPORTED CATTLE.

THE SHORT-HORN is probably the most cultivated or artificial breed, and is notable for its great size and beauty. They are large milkers, those with a cross in them being best, as pure-bred stock of any of the imported breeds are not good milkers. However, when a bull is purchased for exportation to cross cows of good breed in India, it should be of pure blood.

Short-horns are red or white or pied red and white, but no black is allowed in this breed.

Like all English cattle they do not stand the sun well, and they require great care in India.

The LONG-HORNED breed are less common than the last mentioned. These have horns over three feet long. They are good milkers; but, until recent years, the breed, for some reason or other not known, had become rather scarce, when steps were taken to form a long-horn society and revive the breed.

SUSSEX and DEVON cattle are much like each other: the former being larger and coarser. The Devon cattle have horns of a waxy tint and texture, which are fairly long. Both breeds are of a red colour, with a little white generally about the belly and udder.

The milk is less than that given by short-horns, but that especially of the Devon is much richer in quality, therefore this breed is desirable to introduce to this country *to improve the size of cattle and the quality of their produce.*

The ALDERNEY gives the richest milk of all English cattle. But these are not large beasts when compared to those formerly mentioned, and they are generally kept in England by private people for their own use as milchers. They, as a rule, are not givers of large quantities of milk, though compared as milchers to any cattle in this country, they are far superior both as regards quantity and quality.

The AYRSHIRE cow is a large producer of milk; crossed with the short-horn the breed makes the best dairy cattle probably of any cross.

KERRY cattle are of a fair size and are large producers of milk.

GALLOWAY and HIGHLAND cattle are both hardy and good grazers, and produce a fair amount of milk, the former being the better of the two in this respect : but it must be remembered that though these animals are hardy in a cold climate, *they are the reverse in this*. Therefore they cannot be recommended even to be crossed with country cattle. Leaving these two last breeds out of the question an ample selection is available among Short-horns, Long-horns, Devon, Alderney and Ayrshire breeds ; as also NORFOLK and SUFFOLK cattle, which are polled, that is to say hornless, and are supposed to be the best dairy cattle either in themselves, or crossed with the Short-horn. They are good sized cattle and good milkers, and though mentioned last, are by no means the least valuable.

Very few Europeans have taken the trouble, or gone to the expense of trying to improve to any extent the native breeds of animals. There is, we trust, a time coming when Government will take steps to give the natives an opportunity of realising that an improvement in the breed of their animals would be lucrative in every sense, and this can only be done by placing at the disposal of villagers bulls of a good stamp under the care of some person made responsible for their care. In some places this has been done, but the bulls have been kept too fat, and natives have no judgment in breeding.

BUFFALOES deserve some comment as dairy cattle. Being nocturnal grazers, they thrive best when taken out at night ; as during the heat of the day they

feed but little, preferring to wallow in mud and mire in some sequestered spot which keeps them cool and protects them in a measure from the numerous varieties of flies and mosquitoes that infest these jungles. In fact the more jungly and swampy their abode the better it suits them. They endure confinement badly. Buffaloes differ much in quality, both in size and milk-producing qualities, according to the district they are found in. Their milk is of a much richer quality than that of the cow, of a different flavour, sweet and agreeable to the palate. It is considered too rich for ordinary use. The butter produced from buffalo's milk is much larger in quantity than from the same amount of cow's milk. The milk is more difficult of digestion; the butter too is of a more granular nature, neither so white nor waxy as that produced by the milk of the cow.

A native might successfully adopt buffaloes as dairy cattle, but it is very questionable if a European could do so, because they are animals that *to pay* must have grazing at night. Little control could be kept over the buffalo herdsmen, but the nearer their studs were kept to their place of grazing the better. They consume an immense quantity of swamp jungle grass or grass of almost any description, and destroy much more than they eat by treading it down. They are also fed in sheds with oil cake and paddy chaff, as also husk of the rice grain which is winnowed from it in cleaning, boiled and mixed with oil cake and chaff. But the subject of feeding is fully dwelt on in another chapter. In some places up-country they are kept in confine-

ment, and give a satisfactory yield of milk, though fed on most frugal sort of fare, such as nettles, but such treatment does not suit them at all in Bengal.

CALVING.

IN India calving is not regulated to any season as is the case at Home; though it could be so here as well as anywhere else. Not because of the severe weather as at home having passed away and the spring bringing with it new pasturage, but so as to have a certain number of cattle giving milk in succession. To a certain degree, at least, this method could be adopted.

The writer of this has known of some dairies having been started in this country on a small scale, that would have been otherwise successful, but on account of the dairies not being *always* able to supply their European customers regularly, who objected to changes, the arrangements of these establishments fell through. In this matter of the supply being at times deficient to meet the requirements, there was a want of management which should never occur; steps surely could have been taken to supply the defect, in either the purchase of cows in milk, *temporarily* to be kept to supply the milk, or they might have been procured on hire for the time being.

The length of period in most cases of a cow going in calf varies from seven months to seven months and two weeks, or forty two weeks, but the latter is the

exception. Seven months is generally the time. During this period every care should be taken that they be not over-driven or have to go long distances, especially during the last three weeks before calving. Care should be taken that no cow is in poor condition before she calves; if so, she should be put on better food, and a larger quantity of it. Especially during rain and cold the cow should be sheltered in a stall or shed.

She should be cared for, that she be not butted by her companions, or beaten by the *goalah*: in fact, a cow should never be beaten, and natives are most prone to do so.

About says two weeks before calving the udders fill out. *Sometimes excessively so*, causing pain to the cow; in such case she may be milked, but it is not recommended. If she is milked, it must be repeated regularly. This, no doubt, in some degree injures the calf's future, as the first milk is of a peculiar quality, which is as medicine to the calf, as well as food, when it is born. Sometimes the cow *must* be milked, or inflammation would set in.

Before the calf is born, on both sides of the junction of the tail with the body, if a hollow appears, it may be expected the cow will calf soon.

If she is restless and moves away from the herd as if seeking for a safe place, she should be taken to the nearest shed, if at home, to the calving house, and left alone for a short space of time, though watched, yet not interfered with in any way.

The *goalah* knows very well how to attend a cow under these circumstances, but it is necessary that every master of his establishment *should also know* how a cow should be treated under all circumstances. The servant respects him all the more for so doing, and fears to do wrong, knowing he must do what is correct, or be justly liable to punishment.

As a rule the calf will be born with no difficulty, fore-legs and head first; *sometimes* with its hind legs first, and it can be taken from the cow in this position: but occasionally other portions present themselves, in which case interference is necessary, and it must be properly placed before it is born. If the cow be a valuable one especially, some good veterinary surgeon must be sent for at once. As a rule, however, very few misfortunes happen in calving in this country, for though *goalahs* are an illiterate lot and very ignorant, they are very well versed in what should be done in such matters. Yet, in the case of a valuable animal, it would be advisable to call in a good veterinary surgeon, than run any risk; and this should be done at once and without any procrastination. The afterbirth will come away some hours after calving, and should at once be removed.

It is the custom for well-to-do natives who can afford it to give every cow of good stock some pounded spices in her food, or put down her throat in the form of a bolus after she has calved. Farmers at home, after a case of severe calving, give the cow a pint of good strong ale, which serves the same purpose as a tonic

stimulant. This may be very good, though not at all necessary unless the case has been a bad one. The cow should at once be milked, probably she may not give much milk at the first milking, but the calf being placed at her side may induce her to do so. Then the calf should be allowed to suck her at intervals, after being left with her for a few hours at first. After this the young creature will be placed in the pen with the other calves.

In England the cow is very often not allowed to see her calf at all: but this seems a most unnatural proceeding, and it is not to be recommended.

Warm water should be given to the cow to drink, *more especially* if she has had to endure a difficult calving. It should always be supplied to her for a week, or at least four days after calving. Care should be taken now that she be not driven out to graze in rainy weather, and otherwise be subjected to cold or draughts, even in the building she occupies. The stalls are the best place for her; there she is not only sheltered by the building, but by the stall also, and she should have a blanket thrown over her.

It may be as well to mention here that sometimes a *falling of the womb* occurs owing to the cow being in a relaxed state and from straining during calving pains, which natives as a rule do not know how to treat, and, therefore, let the poor creatures die a painful death.

Difficulties and complaints in calving.

This, however, is a very simple and easily cured

ailment which chiefly large milkers and large cattle are subject to, especially old cows of such classes.

The remedy is very simple ; get your *goalah* to replace the portion that has fallen, and even a little more than that, press it gently up, while the cow is kept standing ; then inject with an enema a strong solution of alum, which can be readily got in the bazaars, or a lotion of sulphate of zinc or sugar of lead. All these substances are astringent, and are all that is required ; any one of them will suit the purpose for injecting.

Milk-fever sometimes occurs from overfeeding before or after calving. Prevent it
Milk-fever — prevention and cure of. thus : if the weather is very warm, give laxative food, bran mash ; and if the udder is very much distended, milk the cow twice a day (even before calving, and up to the time the calf is born, *if absolutely necessary*).

If fever has occurred, the matter is rather serious, and she must be treated promptly or she may die.

If she totters and staggers, looks wild and feels restless ; her udders are swollen, are hard and hot ; give her a good strong dose of aperient medicine at once : castor-oil will do, or any of the other aperients recommended at the close of this work.

Local soreness of the udders is best treated by first
Local inflammation not developed into fever from overfeeding, blind nipple or danger of it. an aperient dose, then apply mustard-oil, *karwatail*, with a small teaspoonful of table mustard mixed in it, to the udder. *If there is inflammation and*

swelling, then foment with hot water, or what is better, a strong warm decoction of poppy heads or hot water with opium dissolved in it or laudanum.

In milking, the cow may kick ; or when her calf sucks her, either kick or turn round, showing signs of uneasiness ; for this the native remedy is very good, turmeric (*huldee*) pounded, and lime (*choona*). This is made into a thickish consistency and plastered over the udder twice daily. It is very good for any inflammations. Probably on feeling the udder you may feel lumps forming, which, if not attended to in this way, suppurate inwardly, sometimes outwardly, and cause blind nipples.

You may experience difficulty in throwing a cow if you are an amateur hand ; but To throw the cow to give medicine. it is quite easy. Tie up one of her fore-legs, and tying a rope to her tail, pull it, and she will sit down. Get some one then to hold down her head and neck, and raising her mouth, pour the medicine down well back by the side of the tongue, which should at first be held and drawn out slightly.

If the cow suffers great pain in calving, such as Tonic after difficult calving and treatment when in pain. appears to make her eyes look glassy, give her a small dose of opium, two or three grains, not more, at a time. A decoction of *neym* leaves, or cherretta, or a pint bottle of beer, make a tonic which may be given twice or three times a day.

THE CALVES OF THE DAIRY-FARM.

THE following chapter contains much that is new to this country ; very little has been done, in the way of

feeding calves so as to get more of the milk from the cow, but natives to some extent practice it, feeding the poor little things very imperfectly on rice-water and salt, and then rice and salt, which is quite insufficient, and not calculated to produce bone in young stock.

The way they get the calf to drink is by letting it lick salt from the hand in which some rice water is placed ; then rice is given, and the hand let down to the vessel containing rice.

That a calf should at once be weaned cannot be recommended. What is desirable is that calves should be partially hand-fed, and it is a good practice if not carried to such a degree as to stunt the growth.

If properly fed, they thrive better than being left on an insufficient, or even on what is thought a sufficient, allowance of milk. A Bengal cow would give, say 3 scers of milk in all in a day ; a calf in England gets 6 to 7 pints of skim milk given to it daily, which exceeds the entire amount of milk a Bengali cow gives, but the size of animals must be taken into account.

Among the calves there will be a selection made, and only those kept that seem in every sense the best, the remainder later on will be either fed at home and made over to the butcher or be retained for stock purposes or sold, which is most likely.

While in England it is thought quite unnecessary to be encumbered with the calf, which consumes so much milk, and the cow can readily be milked without it, in this country it seems to be the prevailing idea that

the cow cannot be milked without her offspring being tied near to her, not unfrequently to one of her fore-legs. This is owing a great deal to the bad treatment the animals undergo by natives, as also through errors in management generally.

Certainly, country animals are as a rule more fidgetty and suspicious than imported animals, but the reason of that is, that instead of talking and directing the animal by the voice, the native prefers to direct it with a thump or a whack with a stick. Further attention and consideration will be devoted to the subject of milking in our next chapter. A cow may, if deprived of her calf in this country, fall off in milk very rapidly.

A calf at a month old requires a great deal of milk. If the calf has to be fattened for veal, it should be kept in the stall with the cow, and tied near her for a day : and after that only taken to her to suck three times a day ; but as the calf will not be able to consume all the milk, some must be drawn off first.

By degrees the young one will begin to eat other food, such as linseed cake and dried grass, or linseed cake and chopped straw or hay.

Some good authorities recommend that they should be fed with whole peas and beans (the latter we cannot get in this country of the same description) ; but peas alone can take their place. At this time of life calves will eat peas, though not so later on. Wheat-flower mixed with beer is given to them in balls to induce sleep which promotes fattening.

At two months old it is fit to be slaughtered. Calves being reared for stock, and for sale as stock, must be taught to suck the fingers, gradually drawn down to a dish containing milk, and the calf's head meanwhile gently pressed down to it. Force must not be used. The skim milk may be improved with many substances, such as barley meal, linseed boiled and mixed with it and gradually increased in quantity, as also rice, which, however, does not contain the principles of nutriment nor the fattening qualities the foregoing do.

Calves thrive wonderfully in this way, and progress as rapidly or even more so than they would with the cow, and this plan can always be adopted when any misfortune befalls the mother.

The revolting process of bleeding calves which have to be turned into veal is practiced thus: three or four days before they are killed they have a large quantity of blood drawn off; then the operation is repeated just before they are killed.

This is the method of producing veal even for the refined palate of our modern times. The same has been practiced for ages past in England.

From the former method of gradually as it were weaning the calf from its mother, the reader may see what an immense saving is made in milk. Here the calf only gets what the milker chooses to leave for it; but no provision is made for any shortcoming, in the quantity the calf gets. The Indian dairy-keeper will readily see

the vast defect of the common system practiced throughout the length and breadth of the land. There remains not a doubt that the stock are greatly injured by it, as also less milk is obtained than there should be.

The reader will see, too, that by drawing off the milk as often even as three times a day, it will be replaced all the sooner. This is a fact well known and acknowledged, as also that the cow will not let down all her milk; there is sure to be some stored for the calf. But some cows let down their milk more readily than others, which leads to the terms "hard" and "soft" milkers. This carries us on to the subject of milking.

MILKING.

A cow roughly spoken to, much more so beaten, will decline to give up its milk. Beating and rough speaking to cows, detrimental. And we assert that *goalahs*, without exception, are in the habit of thus ill-treating their cows, although considered a sacred animal: and the result is in nine cases out of ten that the cow is blamed for not letting down her milk. It remains a matter of question if *she could do so* under the circumstances of having sundry whacks and kicks administered to her.

It is natural, too, that she should be cunning and try and hide away some sustenance for her young, which could better be removed from her by kindness than by harsh treatment.

Some cows are utterly and permanently ruined by this ill usage ; others for a prolonged period, until kind treatment has caused them to forget it.

It can readily be understood why many cows flinch at the sight of any one passing near them, and even run away, a common occurrence that may be seen every day. One can see at once how these poor half-fed creatures have been beaten, so as to mistrust man ; and beating itself can be commonly enough seen, leaving out the question of searching for evidences of it in other ways.

The proper time for milking in the morning is at day-break, when the mosquito has become inactive.

Commonly, when these pests are numerous, the *goalah* lights a fire close to the side of the animal he milks, and creates as much smoke as he can by adding some half-dry tinder or grass. This is not objectionable if the milking is done quickly and the vessel to receive the milk be not smoked itself, as it will not affect the milk in any noticeable way. It keeps off the mosquitoes and flies, and in so much does good. But when the vessel to contain the milk is smoked, it imparts its flavour to the milk in such a degree as to make it quite unpalatable for European use. It is also done by *goalahs* to preserve the milk ; but to enjoy it requires an acquired taste, and few Europeans ever approve of it, though natives like it, and often will not purchase any milk that is not smoked.

Smoke as applied by natives
to drive away mosquitoes.

In the dairy the practice of lighting fires would be dangerous, as it would sooner or later be likely to cause accidents ; perhaps, the only way it can be recommended is to burn a certain amount of rosin over a charcoal fire at a doorway, through which a breeze is blowing, in the evening just at sundown, when the mosquitoes flock in in swarms from the fields, grass and jungle around, to prey on the blood of the cattle. It is well known insects object to strong scents of several kinds, and they are to some extent kept off by this, as also snakes ; and burning rosin in this way is not disagreeable to the smell.

In an establishment so heterogeneous as a dairy carried on on English principles, when pigs would be kept, Labor difficulties of a mixed farm in India. the natives employed on the farm would be rather a matter of difficulty on account of caste prejudices ; but this is surmountable. A great deal depends on the caste of men employed, the number of which will depend on the size of the farm.

One man has been known to milk as many as eighteen cows daily throughout the summer months, but this is beyond the rule : ordinarily, one man can milk twelve cows, and more than this should not be allowed. In this country much depends on the facility with which cows are milked, and the quantity of milk they give, when the nature of the labourer as well as the climate and time of the year will have to be taken into account.

Firmness and kindness go a long way with natives, generally speaking, and beget good work ; whereas leniency, false kindness, and laxity in attention, quickly frustrate all endeavours in getting even indifferent work.

If the cow has been laying about, her udders should be washed and dried with a *jharan* or duster ; as also the *goalah's* hands.

A native squats on his haunches to milk native cows :
How a native sits to milk a cow. tall cows are not easily milked
 this way, and a wide four-
 legged stool should be made for your *goalah*.

Sometimes the cow has its hind legs tied, but it is not always necessary ; some cows, however, from custom prefer to have themselves so milked, and will not allow themselves to be operated on unless it is done ; others will stand perfectly quiet without being tied.

However, don't allow any force to be used. If force be used, the cow will object, and generally get the best of it, by not allowing herself to be milked, or not letting down her milk.

Let the *goalah* milk in his own way, and see if he milks with the fore-finger and thumb (that is called *strip-ping*) and is only done to take away the last of the milk. If your cow is a large milker, this *goalah* will not suit you, unless he *very quickly* learns to milk, grasping the teats one in each hand and closing the entire hand, beginning with the

* Milking, the two ways of doing so, *scrubbing* and *strip-ping*.

fore-finger and thumb and the lower part of the hand last. Don't trust to a man that *strips*, for, if your cow is a large milker, and should the calf not be able to consume what is left behind, she will soon dry up. Under any circumstances you will not have a fair share of the milk.

In such case you should not depend on your man learning : get a man who milks buffaloes : they as a rule all "*nievele*," that is, milk as big milkers should be milked with the entire hand ; spring each hand *well up* in rapid succession, using pressure above as well as downwards. This is of great importance, so much so, that the writer has mentioned it in two places in this work, as to be sure to attract attention.

Ask the *goalah* who *strips* to milk a buffalo, and he will probably say he cannot do so (at least this is the case in Bengal and the hills) ; or if the buffalo has been milked before you on previous occasions, you will see not only the long time he takes over it, but the extraordinarily small quantity he can draw away.

There are several sorts of milking machines that have been invented, but there
 Milking machines. is one, a very simple affair, an India-rubber tube, which inserted into the hole in the teat and the other end placed in a pail, draws away the milk and causes the cow no pain whatever.

The *goalah* sits with a *butlohe* or gun-metal vessel put between his knees, and milks the cow. The milk-maid or herdsman in England or the Continent puts a

pail before him and milks into it, but that matter of difference is of little concern, because if the *goalah* milks into a smaller vessel, he can readily empty it into a larger one at his side, and if the cow kicks over the vessel, not so much milk is lost.

You will at once recognise the sound of a big milker being operated on : there seems to be one continuous flow or volume of sound ; whereas, when a small milker is undergoing the process, the milk seems to come away more or less in jerks, and which can be scarcely heard.

If, and it may be often the case, your cows give trouble in milking, your man may be playing some tricks on her. It is *most likely* he is doing so, and your best plan will be to discharge him at once and without further question. Very few cows are actually vicious, generally speaking they are docile, timid animals, and peaceful to a degree. They sometimes attack, simply through fear, or to defend their young. Sometimes the man may not be at fault, but you will have to watch closely, to detect that he does not pinch or tickle the animal. Examine her teats, perhaps they may be chapped or sore. In that case the machine before mentioned is as good as any invented for the purpose. Care should be taken that her nipples are never left wet and are always smeared with goose fat, butter mixed with a little wax, or hog's lard and wax.

Some cows are very subject to this complaint, and

Snakes are said to drink cows' milk from the animal.

if you are a resident of the plains, the chances are your

goalah will tell you a snake has been sucking the cows and the cracks are the teeth marks. That snakes do suck cows is known, and has been verified by tolerably reliable people, but you can put no confidence in the *goalah's* statement: use the machine abovementioned, and ten to one you will find that the cow has her full quantity of milk taken from her.

(The snakes that are said to suck cows are of the Dhamin variety, non-poisonous, and also in some jungly places there are other varieties said to do so; but the writer cannot vouch for the truth, further than he has reasons to believe that they do so, and that also some cows having been found to have little or no milk in the udder when milked, have these marks. In one case lately, the cow thus affected belonged to a servant, who had no reason to deceive, and who asked for a remedy, which was supplied; a little oil, camphor, and a few drops of carbolic was applied, and the marks were not renewed, and the former were healed, and the cow gave milk as usual. The snake was watched by natives, and said to have been seen previous to this treatment, but the reader can take this assertion for what it is worth till proved).

In India the calf is generally tied to a peg near the cow, so, if you purchase an animal that has calved already before you bought her, she may resist being milked, or of giving up her milk if otherwise treated. But, if it be her first calf, it is recommended she be milked first, then have the calf put beside her to induce her to let down more, and after what has been intended to be drawn, to let the calf suck. In such case, should the calf die, there are far better chances of her not drying up so soon as she would otherwise do.

In the former case, however, if the calf dies by misfortune, you will experience great trouble in milking her, and will have to get the calf skinned and stuffed

and placed beside her for her to lick ; also you will have to indulge her with salt while she is being milked.

Chills cause soreness of the udder and inflammation,
 Chills, what they cause. which must be guarded against
 as described later on in this
 work. The calf should also be allowed to suck along
 with the treatment advised.

Too great care cannot be bestowed on scalding all milk vessels immediately after milk has been removed from them. This should be done with boiling water, and the vessel should then be washed and put away for future use

As before mentioned, Spratt's salt-roller may be most beneficially put up in every stall. The cows enjoy licking it, and it is healthful.

In milking, some cows will not even with the calf near them give up their milk ; in such a case it has been said that a sack with brewer's grain placed on the back of the cow makes her give up her milk. This is an experiment that may be resorted to ; but the best plan is to get rid of such an animal, unless she be very valuable and you cannot get your price for her.

Troublesome milkers for household purposes are a great bore ; for then you actually find when buffalo milk has to be purchased what a very different article it is to home milk, fresh, unflavoured with smoke, and unadulterated with ditch water ; it will also be found when purchasing butter from the bazaar, that it is very often adulterated with mashed plantain.

FOODS AND FEEDING.

CHAPTER IX.

THE cow's milk differs greatly in quality according to the nature of her food, and when she has recovered from calving, it is the time she is giving her largest return to the farmer. She should be kept in a stall, or at all events in a shed protected from the sun and excessive heat if in the warm seasons, and from the cold winds during the cold. She must be put either in a shed or stall as soon as she has calved, if she has been in the fields, and has given birth to her calf there; she should have a blanket over her for some days after calving to avoid being chilled.

Each cow having a calf is kept in its own stall, of which there is a row or double row. If they are in sheds, they are tied to good strong posts a yard to four feet apart. In feeding, care should be taken that the food is given in small quantities and often. If much is placed before the cow at one time, she breathes on it, and soon gets disgusted with it, refusing to eat it.

If mixed farming is conducted, there will be chaff and straw on the establishment, or
Food which should be kept in store. it will have to be purchased.

A store of oil cake is necessary, both of rape and linseed separately, also of bran: the latter being very highly estimated by a great many authorities as milk-

producing, and the writer can also vouch for the correctness of the statement. Roots, *when they can be got*, such as mangolds and turnips should be added to the food, as also boiled gourds (*kuddu*, so called by the natives): as also pumpkins (*kadema*), but the latter are not so much relished as the gourd or white *kuddu* or (*koomra*), which may be seen growing on the roofs of villagers' houses. Turnips impart an objectionable flavour to the milk, if given in large quantities. Gram and peas coarsely ground and cotton seed ground, add to the variety of food which may be mixed with chaff for the feed of milk cows. Carrots, too, are useful, as also sugarcane and the varieties of corn called in this country *gohma* and *baja* cut and given to the cattle as green food with cut grass. Lucerne thrives well in this country, and so does prickly comfrey and a variety of grasses, all of which can be sown for the cattle, but must be given with caution, as they are stimulating. The dairy farmer is not wanting in resources in this country in the form of food, and there should be no cause whatever for complaint on that score.

It must be pointed out that gram is fattening; that it should be given with caution; *for dairy cows should never be in fat condition, yet they should not be lean*; so, in the admixtures of food, judgment must be exercised and results carefully watched.

It must not be considered for a moment that farming of any description can be conducted in a haphazard way: it is a profession like all others which requires not only

Get along as you can, will
not do in farming.

theoretical but practical study. The food of dairy cattle, from time to time, should be varied.

The routine of feeding should be carried out on the following lines, as nearly as
 Routine of feeding ; how it should be practiced can be :—

The first thing in the morning at break of day some chaff should be put before the cattle, chaff from wheat or barley straw being better than paddy straw, and is recommended as the most nutritive. This should last till milking is done with, or a little more may be given if milking takes long, and there are many cows.

When milking is over, the feeding proper of the day begins with a good feed of chaff soaked in water, bran or oat-meal and grain. When this is eaten, they are taken to water, the sheds being cleaned, in the meanwhile, and then a little cut or dried grass is given. At 12 o'clock again, some grain, such as corn or Indian corn, should be given, so as to make this the second feed of grain during the day. Commonly only one feed of grain is given in this country in the morning and another in the evening, but it is a bad plan. The cows should have the grain mixed, as has been described in the chapter on soiling, and divided into three feeds or more, and all grain should be given, not whole but crushed, and the entire quantity of food should be divided into *not less than three feeds*, the last one of which should be placed before her as late as after milking. All the grains must be coarsely ground and boiled, and the oil-cake broken up and put into the mixture.

MIXTURE OF FOODS RECOMMENDED.

Oil cake of rape and linseed in equal parts ..	1	seer.
Barley straw, chopped, is the best, but wheat straw will do	1 ½	seers.
Barley, <i>jow</i> , crushed coarsely ...	1 ½	„
Gram, <i>chenna</i> , or <i>boot</i> , crushed coarsely ...	½	seer.
Linseed, <i>tesee</i> , crushed or boiled ...	½	„
Decorticated cotton-seed, <i>banga-ka-dana</i> , <i>banaula</i>	1	„
Bran, <i>chokey</i> or <i>bhusee</i> instead (<i>bran is best</i>) ...	1	„
Salt	1 ½	chat-tacks.

Sulphur, a small quantity,—two or three pinches.

If the cow grazes, then three or four seers of grass mixed with this ; but if not, the entire quantity may be mixed with 12 to 15 seers of grass chopped and given in three or four feeds during the day, and as much grass as the cow can eat besides at intervals.

You should not keep your cows in fat condition ; they should be well covered with flesh, but not fat.

It they get fat, they will not give so much milk, and will soon wish to go to the bull, and the period of milking will be shortened.

The above mixture is about sufficient grain feed for a medium sized cow all day, provided she gets grass in addition given to her *as much as she can consume*. This would suit a cow giving, say, 8 seers of milk a day : less would be required for a smaller cow giving less milk, and more for a cow giving say 12 seers.

A more suitable mixture could not be given, especially during cold weather, and the milk produced would be rich.

I do not recommend *kallie dall* or *woorid* as it is called by natives, given to an animal unaccustomed to it, it suddenly causes colic and gripes, sometimes of a serious nature, and I have in some cases seen horses fed with it die when they were fed with it boiled, because at that place and time no other grain could be got. The last feed should be at 8 o'clock. Feed, say, at dawn, before you milk, or after milking; then at 9 A.M.; at noon; 3 P.M.; 6 P.M., and at 8 P.M.; or at dawn, noon, and in the evening; but the former is far the best plan.

You must know the value of food to the cow, and how it affects her condition and her milk.

THE VALUE OF FOOD AS TO MILK AND CONDITION OF COWS must be considered to make you master of the subject.

Decorticated cotton seed is both milk-producing and milk-enrichening, *particularly the latter.*

Indian-corn is sustaining and fattening, and so is

Gram very fattening and sustaining, not milk-producing.

Bran of barley, but less so of wheat, is *most milk-producing*, but it does not enrich the milk; it is sustaining, contains a considerable amount of phosphates, and given in a mixture to cows is good, and is also good in small quantities to calves, with other grains.

Khassari should not be given to cows.

Rice, boiled, produces poor milk, and is less sustaining than other food.

Barley is very nourishing, but not so fattening as gram.

Wheat is less good as a food for cattle, but stands next to barley; very useful.

Fruits are milk-producing, especially *papaia*, which brings back the flow of milk when it has been checked.

The long gourd or kuddu boiled is milk-producing, and may be boiled and mixed with cow's food: it is very good for them occasionally.

From the above information you should be able to direct how the mixture given for cows should be lessened or increased as to any one grain. If she is getting too fat, omit gram, give barley instead.

If her milk is poor, give her more decorticated cotton seed. All grain should be given boiled and partially or roughly, ground.

Oil-cake helps to produce milk and enriches it.

Linseed oil-cake is good, and in a less measure cocoanut oil-cake.

Mustard seed oil-cake is rather heating given by itself, it should, when used, be mixed with linseed oil-cake, and in this form is best given in the cold season, when it does the animals good, and is gratefully warming and

somewhat stimulating, though not too much so when not given in large quantities.

Till oil-cake is good, but in some parts of Bengal has caused intestinal worms, and great care should be taken to get it pure: when it is so, it is sweet; linseed, also has a peculiar smell that one can always tell it by, while mustard oil-cake has a slightly bitter pungent flavour.

Green food is very necessary for cows; they cannot keep in health without it. *Doob* grass is the best country grass for cattle. Chopped sugarcane, carrots, young wheat or barley, young Indian corn, and such like are all good, and should, when possible, be supplied in moderate quantities to the cattle; large quantities cause surfeit, and at first must be given moderately, then increased in quantity by degrees. Cabbage leaves and roots, such as mangolds and beat, all boiled and chopped up, are good.

Drinking water should be pure and clean, either from a running stream or spring; and should, if carried for the cows, be freshly supplied daily. Rotten tank water is very bad for both the cows and those who drink their milk. Seeing the large amount of milk drawn from the cow, it suggests itself that they must have a good quantity of water to drink; in fact, they should have as much as they want, as if they are deprived of it, they drink any filthy water they come to. Without water the flow of milk is checked, as also if they get too little of it.

All steps should be taken to keep up a steady flow of milk, and to do this they must have plenty of water.

In the hot dry months of March, April, and May, they require more water *and* improved food, which you will be able to give them if you have carefully read the former part of this chapter on the value of food.

PREPARATION OF FOOD.

It may seem some trouble to have the grain ground daily, but it is very necessary to do so, as the cattle derive the greatest benefit from this food, which otherwise passes through them undigested and does them little good, and probably by thinking they had not had sufficient grain, you would be inclined to increase the quantity, and even then they would not benefit by it. In boiling the grain, too much water should not be used, and what remains of it should not be thrown away, but be given with the food, the whole forming a sort of mash. All the grains must be crushed or ground coarsely and boiled, except the decorticated cotton-seed, which must only be crushed, *not boiled*, then steeped in water till soft. On the cotton-seed in this country may be seen, not unfrequently, some cotton, when it has not been decorticated or cleaned carefully. This is very liable to cause colic, and must be paid immediate attention to. The cotton-seed should be put into a large iron cooking vessel (*karahia*) in small quantities at a time, and stirred over a fire to prevent it from burning, and then rubbed in the hand before being used, and if there be much cotton on the seed, it will

thus all come away. The bran must be added to the mash just before taking the mixture off the fire, to boil it only slightly, or it may be added afterwards. The oil-cake must be added to the mixture when it has cooled down a little, and then it must be broken up into small pieces when added. Never make any very sudden changes in food: it is liable to cause some disturbance or illness. When any change is necessary, it should be made by degrees. The grass when added to the mixture should be chopped fine and put in when the mixture is cold enough to give to the cows. Chaff when given should always be chopped. The salt and sulphur should be ground and added when the mixture is boiling.

The greatest care should be taken in having all vessels clean for cooking the cattle's food in, as also all *nads* or troughs for feeding cattle well washed daily—morning and evening. Also all vessels that contain water for watering cattle.

The neglect of these small things is sure to engender disease sooner or later, perhaps in the form of an epidemic, which may run its course, going all round your stock, and perhaps you will lose some of your best cows or bulls, which cannot be readily replaced, except at great cost, and causing great temporary inconvenience.

The quantity of land required to keep a cow well in India has once before received attention, but it is quite as well to repeat it here; much depends on the sort of cattle kept and the quality of the land.

THE MANAGEMENT OF THE COW AND BULL.

CHAPTER X.

THE Bull, of whatever breed purchased, should be a thoroughly good type of his breed, of pure race or breed: because, however careful one may be in his selection, after the lapse of generations, the unimproved breed shows itself when breeding with cows whose progeny it is proposed to improve. In technical parlance this is called *atavism* or "*breeding back*."

The bull.

He should be of pure breed.

It is a most important matter that the male must be quite free from defects; for the first male especially that is coupled with a heifer affects her after progeny to a very great extent all through her life-time. It can therefore be understood how carefully the selection should be made.

The bull should be without defect or blemish or deformity.

The best age for a bull to be is two years old, at which period of his life he is possessed with a full degree of vigour; at all events he should not be more than three years old when bought. He should be thoroughly masculine in appearance, and have nothing of the appearance of effeminacy about him.

The best age for a bull.

If the bull purchased be a valuable animal, a good plan will be to rear a bull, one of his progeny, every year, in case any misfortune befalls him, so that he can be at once replaced.

He should be kept in the bull shed all the year round, being a difficult subject to manage, even though climatic influences tame him considerably. A native cannot deal so readily with him as a European labourer. He should be given exercise daily, and for the purpose of leading him, it will be found convenient to have a ring through his nose. A yard of small dimensions should adjoin his shed.

At sixteen months a bull is fit for heifers for their first calf. A cow comes in season every three weeks. A bull can serve a great number of cows, and on some farms in England as many as sixty have been allowed them; the greater number of which he has been mated with in one month and a half to two months; but this is a bad plan. If his services, however, are spread over a much longer period, say for a year, one bull will be sufficient for any dairy here. When the dairy breeds its own stock, they must not be *in-bred* animals, and on this account there must be a change every two or three years in the bull kept, and a strict written record should be taken of all stock as to their breeding. A heifer should not have her first calf till she is quite three years old, and in the omission of this care much degeneracy is produced in stock, in this country especially.

The bull house.

When a bull is fit for heifers,
etc.

When a cow is shy of taking the bull, which is not uncommon, it has been advised to drench her with the milk of one that has already taken the bull, or to pour some of it across her loins; but a great deal of this precaution will be found unnecessary should the cattle be properly fed. Molasses or *goor* is good to produce this state in cows. The bull should not be kept in a too highly fed condition, or he may be useless.

A statement has been made in a paper, bearing some authority, that the future sex of the progeny of a cow may be known by the following plan: "If a heifer calf is required, the cow is allowed to take the bull as soon as she comes in season; if a bull calf is desired, she takes the bull when going off." This assertion is, of course, open to doubt, till proved by those who are interested in the matter. Before advancing to the next subject, it is best to add a few words of caution that may be of use to the amateur. Native villagers, and your cow herdsman also, know the value of a good bull, and if you do not put restrictions on the herdsman, he will allow your bull to serve village cows; till eventually you may find he is not fit for your herd, or in other words he may be barren. The author has seen instances of this kind happen in this country. Probably the *goalah* made a good speculation at his master's expense.

Moreover, you must see that your bull, just as well as any of your cows, be fed carefully with not too rich but good nourishing food, such as barley or wheat. Cotton seed and gram should be prohibited, and only a little oil-cake allowed at each meal. He should have

exercise daily, but not be exposed to heavy rain or the extreme heat of the day, if he is of imported stock especially.

By having a nose ring on, he will be more readily managed if a rope is fixed to it and tied round his neck, to be opened out and held at any time to lead him when necessary. Then your *goalah* will not have the excuse so readily at hand that he could not be managed, and ran away to the village after some villager's cow, or to fight some other bull he may have been supposed to have seen during his daily exercise.

It is best not to keep him always with the herd of cows, because he may do them an injury when pregnant, or if he be a heavy animal. He should be led to a cow when it is necessary, and thus he will be found at his best as a rule. He should also be groomed down daily, and by this method he will be more accustomed to be handled, otherwise he may be troublesome. If all bulls were thus handled from an early age, they would be more tractable.

THE BARREN COW.

THERE are probably fewer cows in this country that turn barren than in England and the Continent; but there are no statistics which would guide us to make this affirmation with certainty, though it would appear, from daily observation, the percentage of such must be far below that of barren cows in England and the Continent; the difference being so great that the statement may be made with comparative safety.

The causes in a great many instances are artificial foods and artificial treatment, and it has also been attributed to a certain diseased state of grass and grain seeds called ergot, which when eaten by cattle produces miscarriage. In foreign countries frozen roots have produced the results under review, which are important to every farmer, and should therefore be carefully investigated.

It has been remarked by some authorities that one in ten, or as great a number as ten per cent. of cows, get barren in England every year. Some cows do not bear, while others cast their calf.

Very many farmers insist that it affects the flock to keep these barren cows with the flock; and for various reasons mentioned in the foregoing chapter, perhaps it is better they may be removed rather than try to breed from them; so either the plan of trying to get as much milk from them as can be got, may be followed out after they have cast their calf; and as soon as they are dry, feed them up for butcher's meat, or they should be sold to the butcher at once.

To fatten such cows, care must be taken not to give them too forcing a food to start with; as it is only wasted by being burnt in the animal, or passing away in the manure. Boiling water should be poured over the food, which should be composed of chaff or straw, and three seers of linseed oil-cake, and allowing it to stand and ferment for some time according to the weather being hot or cold. Add to this 3 seers of gram, first steeped in water, and increase the quantity of it

afterwards: 1 chattack of salt must not be omitted. In the above mixture of food may be added a portion of chopped grass or hay, say from one-fifth to one-tenth. An English method of feeding is with the following mixture: chaff one ton, tares 1 cwt., and 1 bushel of salt, this is kept prepared and mixed, which causes it to undergo a fermentation. This is put in sufficient quantities before the animals, and then oil-cake added. A small amount of grain, especially gram and linseed, added towards the close of the process of fattening facilitates matters.

Small quantities of food should be placed before the animals, so that none be left to breathe on.

The number of feeds given per day should not be under three, but it is best that each feed be divided into two, making even six feeds. The latter stage of the fattening is more rapid, so it is always advisable not to hurry the sale of the cattle which will arrive to prime condition very soon.

It must be here remarked that all stock for fattening are either kept in stalls or loose boxes: that they should not be removed from the same, except to water, and even that is questionable. If they have to be sent a long way to be slaughtered, it is advisable that they daily have a walk to the water and back, provided it is not very distant, because fat cattle cooped up, as it were, suffer from great fatigue with little exercise, if excessively fat, especially unless accustomed to be exercised a little every day. If killed at the dairy, it does not

matter so much if they are not taken out of the stalls at all, but it is certainly conducive to health to do so.

Concerning the matter of the Hindu caste objection to cattle being slaughtered, it will be well when the dairy is first established, that such enquiries as are necessary be made if slaughtering is to be done there, and such rights as are given then should be established in the lease.

THE REARING OF CALVES AND THE CALF-HOUSE.

CHAPTER XI.

THE rearing of young stock is a matter of the greatest importance, and requires careful consideration as influencing the stock of the future.

The European method of rearing calves considered as in India.

When a number of calves have to be reared, a special house is necessary for the purpose, though for a few, any small room may be arranged.

All that is necessary, is a trough for them to feed out of with a few rings to tie them to, and a rack for straw. They are allowed their liberty all day till they are fed, and when they have had sufficient time for this, they should again be liberated in the shed, which, being built according to the most approved plan, has half door and windows, so as to allow them as much fresh air as can be given them in warm weather.

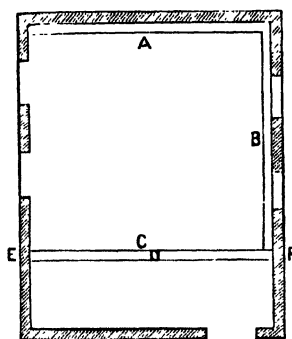
Necessary adjuncts of a calf-rearing house.

The floor should be of masonry, with a good slope towards two drains running the full length of the house to carry off urine. If boarded, there should be spaces left between the boards for the same purpose ; drains being below the floors to carry off the urine. Some of the manure will fall between the boards, so they should be

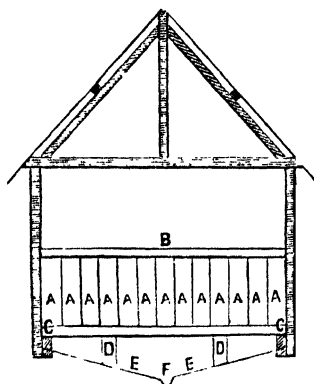
removable to admit of sweeping below them occasionally.

Below will be seen a plan which is considered a good one, and probably the best for the purpose it is intended.

A is the hay rack, B the manger for food, C a partition, and D a platform for buckets, on which they are placed with food for them. The adjoining is a section of the elevation taken at the letters E, F in the ground plan :—



GROUND PLAN.



SECTION OF ELEVATION.

It shews the level of the floor E E with F, the drain D D supports for the joists on which the level of the sparred floor rests, the calves' feeding platform being level with it ; B is the manger ; A A A A A are spaces through which the calves are fed by putting their heads through ; C is a bar placed across to prevent the calves from passing through.

The above is a plan selected from a number given by several authorities, and is the best in every way for this climate.

The rearing of the calf is the next subject that deserves the attention most particularly of those who rear their own stock in this country: such stock, if carefully managed and bred privately, will be found infinitely superior to any that can be purchased of native breeds, especially for milking purposes.

Rearing stock in the dairy or at home.

At home great differences are made in the management of young calves from the time they are born and upwards; some people go so far as to prevent the cow ever seeing its calf, but this cannot be recommended. We think it best to milk the cow first, she is then sure to retain sufficient for her calf (or in the case of native cattle some ought to be left), and after that the calves should be left with their mothers for the day.

For the first week the calf is allowed to suck the cow twice a day, taking as much of its mother's milk as it can. Then comes the consideration how it is to be reared and for what purpose. The best method as regards the calf, and that adopted by *pedigree breeders* of cattle, is to let it suck its mother. The next best plan is to feed it on milk; after that follows milk and skim (that is, new milk and some milk that has been allowed to stand for a short time and been skimmed off its cream); and lastly, milk mixed with other substances.

There is yet another plan, that of allowing two calves to be brought up by one cow; this is objectionable, as it cannot be ascertained if they have had an equal share or not.

The artificial rearing of calves is quite foreign to this country, except in rare instances, so the subject is one to which the dairy farmer must, if he adopts it, pay particular attention to. Several plans are adopted, out of which a few of the best are only treated of—

1st. New milk is used for a fortnight, when it is sup-
 planted by two-thirds new milk and one-third skim
 milk, which has been boiled and allowed to cool down
 to its natural temperature. In a fortnight half fresh and
 half skim milk are given and boiled linseed is added to
 it. After the calves can drink this semi-liquid food,
 skim milk only is given, and they are induced to eat.
 Five pounds of linseed oil boiled will make seven gal-
 lons for five calves. *2nd.* What is better is one mea-
 sure of wheat ground to meal, to two measures of
 linseed, also ground and boiled to a gruel of the thick-
 ness of cream or thicker, and mixed with skim milk.
3rd. Linseed meal or oat meal, a pint of either for
 each calf, mix it with cold water and then hot water
 to make the amount for each calf up to two quarts.
4th. To take any of the several cattle food mixtures
 advertised, make it into a gruel of a moderately thick
 consistency and mix it with skim milk.

When the calf is put into the rearing house, at say
 about a week old, it is very much more likely it will
 learn to drink than otherwise left with its mother. At
 a week commence teaching the calf to drink from
 the bucket. After the calf is taken from the cow, it
 should have a bucket of food placed before it, in a

corner of the building. Place one finger in its mouth and as soon as it begins to suck, gently draw towards the pail, pressing down the head gently, till the fingers and calf's mouth are in the milk. When the calf learns to suck thus, the finger can be withdrawn.

The usual way is to give the calves their liberty in the rearing house, but in some establishments they are tied separately to poles. Two calves should not be allowed to drink out of the same pail, as one is liable to drink more than its own share. They should be fed twice a day, with milk as their *chief* food till they can eat: it is their best food. Skim milk is best when it has been standing for six hours (not longer in this country). In England *seven pints is not exceeded* per meal in quantity for each calf: if that amount were given in India, it would be much more than the entire milk of most ordinary country cows. The quantity must be regulated by the size of the calf and one of the admixtures allowed, which are mentioned in the beginning of this subject. At a week old they are taught to drink of milk once or twice a day: at a fortnight only skim milk is given, and they are tempted to eat at three or four weeks old. At four or five weeks old they will eat corn, but they must still have some milk. Peas are very nourishing, and given whole at this age are readily eaten, and do no harm whatever in moderation.

With the foods pointed out, it is much more likely that the calf will thrive than on the continued small amount of nourishment that is left to the common country calf.

Privation at an early age spoils a really hardy breed of cattle, such as Bengal and country cattle are, and at least with the addition of some of these foods mentioned above, there is little doubt that they would be far superior to what they generally are. The above may seem very experimental to many readers, but some Europeans and also well-to-do natives have practised feeding their calves as soon as they could do so, and with much benefit, to the knowledge of the author, who has himself fed calves successfully and with much advantage.

Natives practising this plan, however, unfortunately know no better than to suppose rice is a suitable and nourishing food for the calf, which is a great mistake; the calves require something much better, more nourishing, but not heating, possessing both bone and flesh-making properties.

MILK, CREAM, BUTTER, AND CHEESE.

CHAPTER XII.

M I L K.

IN milk there is something soothing to the child and grown-up person alike, to the latter indeed it amounts to a great necessity. If your milk for tea, coffee, pudding, and butter is stopped, or is bad you soon complain. There is no substitute for it in any other article of our household food.

There is little doubt that cow's milk differs in quality, even when not adulterated: that of a young cow with her first calf is poorer than that of an older cow. An old cow gives the richest milk (as a rule, the exception being very rare).

In England, red cows are supposed to give the richest or sweetest milk, but that is not the case in this country, because black or dark-colored cows give as good milk as any. Opinions differ on this point, as one person may happen to have a red cow that gives good sweet rich milk, while another may find it otherwise with one of the same color. It may be said then, as a rule, that *color is no criterion*.

Color of cows as to its effects
in the qualities of milk.

One thing is known, that is, white cows both in this country and in England are not considered good in colour; because, they not only shew dirt more than others, but are more frequently infested with lice than others in the same flock of a different colour are, besides they have more delicate constitutions and give poorer milk. But a white cow with blotches of black or grey on the skin under the hair is better. If a white cow has a rich yellow or yellowish red skin, if her mouth, hoofs and horns are of that colour, she gives rich milk almost to a certainty. Most cows in this country of the country or

Quantity of milk in different breeds. Bengali breeds give very little milk. Beginning with one seer, they may be calculated not to give more than three seers, that is, three quart bottles full. There are of course exceptions to this rule, some having been known to give as much as four seers, which is extraordinary, considering their size, because they are really little bigger than *Gainas*, the minature cattle of India, which are of no further good than to keep as pets, or, as they fatten easily, to be used for beef.

After this follow the bigger breeds, Hansi or Hissar, Nagouri, Guzrati, and other cows already written of.

The above first-mentioned three breeds, when of pure stamp, give as much as ten and twelve seers and over; but it may be considered a good cow that does not give less than from seven to eight seers of milk.

English breeds give more than twice the quantity, but, especially when first imported, are delicate and require

great care, whereas the country breeds in hot climates are all fairly hardy on good high land.

Low lands and low land pastures subject to long inundation of the Ganges and other streams do not suit them well.

Low lands not good for cattle even of Indian larger breeds.

In the hills country cattle feel the cold, to which they are not accustomed ; they also do not like the constant drizzling rain and mist so common in those climates, nor do they enjoy climbing the hills ; it tires them, and affects their milking very considerably. English cattle and especially cross-bred English breeds do better there.

The hills' effects on plains' breeds.

Your cows should give their full quantity of milk for from four to five months of the year, or sometimes more, then by slow degrees the quantity gets less. During seven or eight months the quantity will be much decreased, and it is then that the cow wants to calve.

Duration of milk-giving.

But she goes on giving milk for about four months longer, at the close of which period the quantity may be very small indeed. You can, if you choose, dry her off, but it is not advisable to do so as a rule, unless you have some good reason for so doing. In this country the longer you milk her, the better, because she dries up soon enough without artificial measures.

If, however, she falls off suddenly when in full milk, and shews signs of wanting to take the bull, she should

be given some gum of *kateila* in water, or sugarcane cut up in short lengths of an inch or two, or *papaya* (sometimes called *papeta*) leaves, and also *tookhmalunga*, a handful steeped in water and allowed to swell eight or ten hours. *Kateila* gum and also sugarcane are good for red water, and are cooling. Chiretta, being a tonic, is also pounded and given in balls, in weight about one tolah as a dose, twice or three times a day, if weakness be the cause of the falling off in milk.

To get milk to keep in the hot weather and monsoons, is sometimes very difficult, do what you may ; the best method is to put it over a *very slow fire*, and not let it boil even once in the slightest degree : to do this you must keep it stirred the whole time slowly ; if there is the slightest sign of boiling, lift the pan off the fire and keep stirring till somewhat cooler, and repeat putting it on the fire, and you have what is called Devonshire cream, when it becomes of a thick consistency like cream ; or another way is boil your milk twice a day. Never use a copper vessel to boil milk in, unless very well tinned. Always after boiling pour the milk in shallow or flat wide tin vessels to allow it to cool.

As a rule, tin vessels can be got in the bazaar, but if not procurable, you can, if you are at all handy, make your own of any size you like.

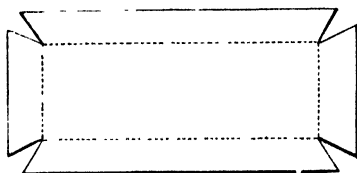
Get a good sheet of tin of any size you want, and cut the four ends as described, and send it to the tinsmith or

Methods of keeping milk good during the hot weather and monsoons.

Copper vessels not good for milk, unless heavily tinned.

A suitable vessel for milk.

native *thataire* to lap over a little at the cut ends, and then to be soldered after bending at the joins on the four sides. The sides of this vessel should not



be more than two inches high when it is constructed.

This will be found the most convenient sort of dish for keeping milk good. Unless you have a great number of cows, such as are kept in a dairy, it should not be of large size. Several of them may be used instead, and this is the better plan.

The sides of such a dish should shelve outwards, and if your tinsmith can put two small handles on the sides of wire, so much the better, as it saves the thumb being put into the milk when it is being lifted for any purpose.

Changes of weather affect milk in a most unaccountable manner, and it is so susceptible to flavour, that nothing with a strong odour should be kept anywhere near it.

It is far better to have a small room fitted up with shelves for milk, cream, and butter only, at a foot and a

Room for keeping milk, butter, and cream in.

half above each other in succession, and have the milk placed in the vessels on these. Such room should be cool, to the north of the building, if possible, so as not to be affected by the sun, and it should be well ventilated, but secure against the intrusion of rats, mice, and cats. To be so, there should be a No. 4 mesh galvanized wire, covering the window or windows as may be the case, and the shelves should not be close up to the roofing to allow of rats getting down, nor should any timbers extend up to the roof or near it. The supports and shelves should also not be less than three feet and a half from the ground. In such case the milk would be undisturbed by rats and other pests, and you would probably get the largest amount of cream to be got from the milk.

In the plains, milk will not keep good in the hot weather for more than eighteen or twenty-four hours with any certainty, and at the end of that time it may have a peculiar flavour which stale milk always will have in the plains, however carefully it may be stored. In say eighteen to twenty-four hours at the latest the cream is very firm and easily removed. In hill stations at high altitudes milk will keep for thirty-six hours, but in the plains it is questionable if it will do that even in the coldest weather in Bengal; especially when once placed to set cream and not reboiled again, as it would be necessary to do for other purposes.

The cream of several days' milk may be collected and kept in a wide shallow dish, and the butter from it

will be all the sweeter, though one would suppose that it would be sour, but such is not the case; yet it is not recommended to keep cream more than two days in the hot weather or three days in the cold season; though in the hills it may be stored from three to four days. Such cream would make sweet butter, but is not good for other purposes, such as puddings or dishes to which cream has to be added.

BUTTER.

THE successful making of butter of nice consistency, depends to a great extent on
 To make butter. the temperature, which unfortunately is not at our command; however, artificial means aid us a great deal, namely, the use of iced water when the weather is too hot, and tepid water when it is too cold.

Fresh milk does not make the best butter, and is
 Fresh cream does not make good butter. liable to turn sour or rancid and have a peculiar flavour after standing for a very short time, even though salt may be added to prevent its being so.

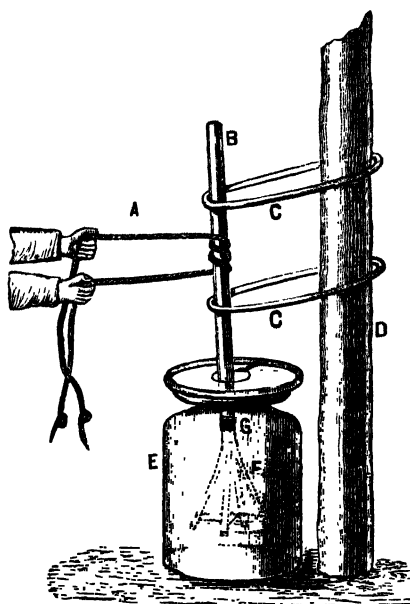
Stale cream makes good butter, *but the cream should*
 Stale cream makes good butter, but cream must not stand on milk for long. *not stand on the milk for long, not*
 more than twenty-four hours anywhere, be it up in the hills or in the plains, but it is hard to fix a time for either place as that depends on the season of the year.

Having a sufficient quantity of cream collected for your butter-making, your next operation is to churn it.

Butter can be made from cream shaken up in a bottle, especially, in the hills where there is far less difficulty in making butter of a good consistency, than in the plains where it is so much hotter, and unless cold (iced) water is used, probably the outturn will be like butter and olive oil mixed instead of being firm when finished off and put in the butter dish. The native churn is an imperfect arrangement; atmospheric churns are undoubtedly the best and can be got without incurring much expense. If you use a native churn, you require a good stone jar, such as pickled salmon is sold in, and you may happen to get one in any European station where there is a bazaar in which it may have been sold by some servant.

Earthenware jars are liable to break and cause loss and disappointment. Your servant who churns the milk, will also require a thong of leather well oiled and twisted, or raw hide twisted. (See illustration on page 120.)

The churn is made of a bamboo split up at the ends and kept separate by pieces of wood, this is put into the jar and operates by putting the leather thong round the bamboo, which is kept in its place by pieces of cane fixed round it and round a post firmly planted in the ground. The lid is made of a piece of wood with a hole in the centre of it to admit the bamboo and prevent the cream and butter from being thrown out during churning.



A leather thong, **B** the bamboo churn, **CC** pieces of cane in form of ring round **D** the post fixed in the ground, **E** stone jar, **F** shewing how bamboo is divided and kept apart, **G** where the bamboo should be tied to prevent its splitting up any more with cane or wire.

If an atmospheric churn is used, and it be of metal, as is generally the case, it should be held with a *jharan*, or the butter will get warmed and be made oily. The best temperature to have your milk at is about 50° to 70° , if it be warmer than that, it is troublesome to make and is liable to be oily; ice, iced water and salt put into the churn then come to the rescue.

As the churning proceeds, the milk foams and the particles of butter separate and are knocked about in the jar or churning machine, but the churning should not be stopped till the remaining liquid is quite free from all greasy feeling when touched, then the butter will be in a lump and none of it left in small particles in the butter-milk. The butter is then well worked with a bamboo knife so as to press all water from it, *but first wash* it well in clear water, *iced water* if it is at all oily from the weather being hot. Get every particle of butter-milk away from it carefully. Then get all water pressed out of it by working at it with a bamboo knife pressing it down on the plate, and it is most likely then that your butter will be good and will keep much longer than if hurriedly prepared, not properly cleaned of butter milk, and not rid of the water *in it*.

Butter in hot climates is best kept in water ; but there should be no water in the substance itself, which should be solid, it will then be sweet and keep well.

The milk is very good for your cows mixed with their food or for dairy-farm pigs. After churning, the churn should at once be well washed with boiling water, wiped and put aside for use again. *This should be done methodically*, as servants fall into orderly ways readily enough, whereas if not looked after, they are apt to introduce habits of laziness and untidiness, which allow of no system at all.

Want of cleanliness will very quickly lead to disappointment in butter-making, and especially in everything that concerns the keeping of milk.

Good butter made from the cream of boiled milk can be churned in much hotter weather than butter from milk, and it will be good under circumstances when butter made from milk would not be so. Then you have butter and very good milk too, because you only use the cream for butter. Boil the milk well, and be very careful that the same spoon is not used on two different occasions to skim the milk, or it will turn sour. The best way is to have no spoon in the room where milk is kept, then in all likelihood a fresh clean spoon will be brought to skim the milk each time. In boiling the milk some saffron may be added to improve the colour of the butter.

The butter is best kept in a porous earthen vessel of native manufacture, in water, and only put into the butter dish before being brought to table; or if there is an ice box, it may be put in the butter dish inside of the ice box above the ice.

Under any circumstances it should be kept in a cool place, the cooler the better.

There are several modes of making butter, but those described here are more suitable to European tastes. The *khansama* makes butter from *tire*, and in that case there is no milk left, but butter-milk which is sour and useless for general purposes, whereas if you churn milk, you have milk that is useful afterwards, or at least can be put to some use. If you make butter of cream you have excellent milk, and the butter is the best you can make anywhere and at any time.

GHEE.

IN India no fatty substance is used for cooking purposes more largely than *ghee*; even in stations where English hog's lard can be purchased in tins and mutton suet bought in the bazaars. If there is more butter than can be consumed for household purposes, or that cannot be sold off at a dairy, the best purpose it can be put to is to make *ghee* of it, which can be used at any time, or sold when it finds a purchaser. Let it boil *gently* in a *degchee* or tinned copper cooking vessel, till small particles of curd-like substance separate from it and afterwards seem to adhere to the bottom of the cooking pot, leaving the boiling fluid perfectly clear.

Then stir and allow it to simmer without disturbing the solid particles at the bottom for a short time, and it is ready to strain off, and when cool, to put into bottles.

When carefully made, this will keep for a long time, only it must be carefully and patiently cooked, or it will turn rancid, as bazaar *ghee* often is, but which can be corrected by the following process. To the bazaar *ghee* add a cupful or more of butter-milk, according to the quantity of *ghee* to be thus corrected, and boil as directed for making new *ghee*.

If necessary, repeat the operation, with milk this time instead of butter-milk, and the *ghee* will be mild in flavour and sweet: at all events as good as any *ghee*, and free from the rancidity that is generally found in the bazaar article.

In selecting it from the bazaar great care should be taken, as many large *mahajan* and shop-keepers store it in large copper *mutkas* or *kulsees* which impart verdigris to it. Such *ghee* when cooked with stew, shews on being put on a plate a greenish tinge, which is easily detected. Ghee it is needless to say is poisonous in this state, and should never be used, as earlier or later it produces symptoms very similar to cholera.

CHEESE.

THERE are only two sorts of cheeses which are made for sale in this country, Bandel and Dhacca or Dacca. The former is a cream cheese and is very good when not smoked, which some of them purposely are. Those that are so, are of a light brownish colour, while those that are not, are cream coloured or nearly white.

The Dhacca or Dacca cheese is rather flavourless when compared to English-made cheese of any description.

Cheese cannot well be made here in the hot weather, in fact it requires it to be very cold to do so, the difficulty also being that the milk is not rich enough in the summer. The following articles will be necessary : rennet and moulds with tops and bottoms for the same ; for the latter any flat board will do, but for the top several round pieces will have to be cut so as to slide into the mould which should be constructed just like a barrel with a hoop round the top and bottom, but only 8 to 10 inches in depth.

To prepare rennet, get from the butcher the stomachs of a few calves which have not been weaned, and clean them thoroughly of any curdled milk that may be in them. These are called *choostas*. If it is to be used soon, less salt is required, but in this country it is best to rub the *choostas* with salt and sprinkle them over with it, then put them in a jar or wide-mouthed bottle. In a cold climate it is sufficient to have a gallon of water in which a fresh egg will float, and add the stomachs of six calves to it, which is allowed to stand for a few days ; but this will not do in the plains.

When it is necessary to use the rennet first described, half one stomach should be taken from the jar, cut up into pieces, some *kagzie* (lime juice) squeezed over it, a teaspoonful of cloves pounded and sprinkled over it, and a pint of tepid water pour over the whole. This is then put into a wide-mouthed bottle and shaken up daily, and in a week's time it will be ready for use. This will keep for a long time, and is used in the proportion of two dessertspoonfuls to coagulate twenty seers of milk.

The milk with the colouring matter of a few grains of annatto should be heated to 85° in summer or 100° in winter, strained, and the rennet added (after being strained also).

Should the rennet be good, the milk will have coagulated, provided, in winter and very cold weather you have placed it before a fire covered with a blanket. Cut it across down to the very bottom of the pail the milk

should have been placed in, and the curds will sink and whey rise to the surface.

The whole may then be put into a cloth and allowed to drain for twelve hours, after which some salt should be pounded and sprinkled over the clot, which should be cut in pieces. It is then put into the moulds enveloped in cloth of loose thin texture, pressing it down gently, and then folding the ends of the cloth over the curd ; the lid should be put on the mould so as to enter it, when weight is gradually added to the top for two or three days, by which time it will be found hard enough to remove from the mould, which should be done by taking out the bottom and tapping gently, holding the mould up at the same time a short height, so that the cheese will not be broken. The cloth need not be removed even after this for a day or two ; but the cheese must be put on a shelf and turned every day till ready for use.

To colour milk, take a few grains of annatto seed and steep them in a little water for twelve hours and then rub them up, strain, and add to milk for butter or cheese according to the colour you like. Annatto for colouring milk for butter and cheese. It has little or no taste, but has a persistent colour.

Milk that would be wasted because it has turned sour, or even skimmed milk, Cream-cheese, how to make it. makes what is called cream-cheese, which is delicious. But this must be from un-boiled milk.

The process of making it is very simple. Put it into a cloth and let the whey drain off. Open the cloth and add salt to taste, then put it in a clean cloth, which, fold over it carefully and fix under a good weight till the remaining whey is drained off. It is then ready for use at once.

BULLOCKS, THEIR REARING AND MANAGEMENT.

CHAPTER XIII.

MANY people are rather inclined to undervalue bull calves, because they come of no use to them: it is chiefly for these people that a few lines on the subject of bullocks is written.

Not unfrequently they are given away to the *goalah* or to the *khansama*, or bearer, for the trouble he has taken in looking after the cattle.

This is a great mistake, as a bull calf is more valuable than a cow calf, either as a bull, or castrated, and then a bullock; that is to say one would get more money for him than for a cow calf from the same mother and equally good in all respects.

Cost of Bullocks.—It is difficult to say what the price of a bullock would be unless you know what he is like, of what size and breed he is. An ordinary Bengali bred bullock fit for plough purposes would be considered cheap in Bengal at Rs. 16 or 20. A cart bullock of the same breed might cost Rs. 40 or much more, and so too of Hansi breed, a single bullock, if of large size, and well bred, might cost from Rs. 60 to 150. The author has known them to be purchased for much more than the price last mentioned, and fancy prices double the figure just mentioned are often asked for

good and well bred Nagourie cattle. It would indeed be rather ridiculous to give away a calf of such value one would suppose, but unfortunately many Europeans are imposed on because they have actually *very little* or no knowledge of the subject. Certainly the recipient of the *bukshish* from the *sahib* or *mém-sahib* would make his *salaam*, and make it appear that he had got something quite ordinary, and you would be none the wiser, nor he at all willing that you should be so : of one thing you might rely, that you would never hear how he disposed of the animal, or if you did enquire by chance, you would hear it was at his home or had met with some untimely end.

The natives generally castrate their animals far too late in life, and it has a detrimental effect on them. Your men will always advise you to have the operation performed at the age of two years, which is wrong without a doubt.

In Europe calves are castrated at from two to six months old : this is because they recover from the operation rapidly at that age, and have a greater tendency to fatten.

*
Time castration should be
done, and how ;

Two sorts of operations can be performed, by which the same end is attained, that is to emasculate the animal. *1st*, castration ; *2nd*, crushing. The former operation should be performed early in life, from the age of two months to six months ; but crushing should not be done till the age of a year and-a-half, or as near that time as can be, and up to two years : because it is very undesirable to have so young a bull among the flock,

who would in all probability overreach the proper bull, being lighter and more active. Such very young bulls should never be kept with the flock, because of what is here clearly stated, as you may have very useless calves, when you probably and correctly expect calves of true and fine breed.

1. *Castration* is not recommended by the author, as you may loose some calves through the operation ; which interferes with the dairy milk production. The calf being thrown, the scrotum is held, and after tying the ligament, the testacles are removed one by one, and the hot iron applied, if there be any excessive bleeding. The calf should then be put in a stall where he is not molested in any way by the other calves or cattle, and kept free from all draughts, for, at this time, should he catch cold you may lose him. Villagers have the operation performed on their cattle, and understand very well how to do it.

2. *Crushing* is much more to be recommended, especially to those who have a dairy, either for the household or in the form of a business transaction. There being no wound, there is little to heal, only a swelling takes place after the operation, and the organ is absorbed, and the animal retains much of its masculine form. Crushing is called *budhea koota* by the natives, and castration *budhea choore.* • Crushing is done by throwing the animal, and having either its head held down while the operation is done or its fore-legs tied up. The operator then manipulates the scrotum to relax it well, and then he places *one* of the glands between two wooden rollers

which are tied at one end, the other end of the two rollers being held in the hand, while another man sits before him and presses the gland to the roller till it is burst, and then it is kneaded, till it is a soft pulp. In like manner the next one is dealt with. Then the animal's nose is bored with a wooden or steel needle, and a rope put through it and over the animal's head. Sometimes the ligament of the testicle is only pounded between the rollers, which has the same effect of emasculating; but it occasionally occurs that this not being properly and sufficiently done, the animal regains its powers once more and may give trouble in requiring the operation to be repeated; however this is seldom the case.

Nothing more requires to be done, but to keep the animal in its stall, only allowing it to move out to have the stall cleaned, and when well enough to go out to water. In from eight to ten days it should have recovered.

When quite recovered, and the creature is in good saleable condition, it should be sold, but not before that, and a very ready sale may be found for it almost anywhere. If of good breed, wealthy natives and *mahajans* are only too glad to have the opportunity of getting such an animal locally, as it saves them the trouble of sending long distances to fairs, to purchase them.

THE TREATMENT OF CATTLE IN DISEASE, OR WHEN MEETING WITH ACCIDENT.

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CHAPTER XIII.

A GREAT difficulty which Europeans meet with in this country when their cattle fall ill is chiefly owing to such gentlemen who keep them not having had any experience whatever of farm or dairy matters, beyond that of having visited a farm yard, and thus having conceived a love for cows ; or perhaps necessity may have led to their keeping them. But it is a very different thing when their cattle are ill ; then they seem a bugbear and they know not what to do with them.

For such the following notes and prescriptions will, no doubt, be found of use ; simply and concisely written for ready reference they may be found handy, and the author hopes they will prov^e so to many persons now who are at the mercy of their cowherd entirely.

It must not be thought that natives know nothing of physicing cattle ; some of them do, and these men have some very good recipes, but the majority are very ignorant of what to do, and give anything in the hope of being paid by their master, peradventure the animal does recover, or otherwise robbing some of the money

given to them to purchase medicine with. A few native remedies are given, such as can be recommended.

Prevention is better than cure, and cleanliness is necessary in the dairy and the cattle furniture and stalls and in the food and drink. The lands the cattle are grazed on, must be well drained, or they cannot thrive under any circumstances, especially during the rains. If pools of rain water lodge about it, the land must be drained. Inundated land is very bad for cattle just after the flood has subsided, and the rotten and fresh grass springing up are mixed. Then hove or hoven, red water and rinderpest, splenic apoplexy or gloss anthrax appear. The last two being contagious and malignant diseases of the worst type.

The cattle should not be exposed to heavy rain such as we have in India, and they must be prevented from getting to bad water during the dry season when the heat is great, when they will run for water to the very first roadside pond or ditch in which there may be any.

If the cattle proprietor has leased lands on which to graze his herd, these lands should be well drained, and have some sheds on them to protect the cattle from rain, temporary structures though they be; and there should be some well or water-course or spring, from which the cattle could be watered at any time with facility, because your servant will not take much trouble in these matters, unless he is an exceptionally good man.

Rinderpest carries off innumerable cattle yearly throughout India. The author saw an immense number of cattle die from this disease last year, and it is said from 50 to 90 per cent. of the cattle attacked by it die in this country.

In purchasing cattle, always keep them separate from your old stock till you are quite sure they are perfectly free of disease.

When there is foot-rot or other diseases about, such as are malignant or contagious, keep your cattle away from all other herds most carefully.

If malignant disease does spring up in your herd, immediately divide any one or more that may be infected from the rest, and use disinfectants all over the dairy regularly three times a day or oftener, be it carbolic or phenyle.

If the sick cattle can be quite removed to a separate building so much the better; as they should be no longer under the same roof with the other cattle, nor must they go to the same grazing ground till perfectly free from disease and quite well again. The dung of such cattle also should be burnt.

Cattle that die of malignant diseases, such as rinderpest, anthrax, black quarter, foot and mouth disease and pleuro-pneumonia, should be buried deep in the ground or the carcass burnt.

Too close attention cannot be paid to these instructions, especially in India, where such types of disease

spread more rapidly than can be easily imagined, and the mischief is often done before it is known.

NOTES AND PRESCRIPTIONS FOR COMPLAINTS.

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1. When a cow is in calf, her milk not unfrequently turns sour, and should be kept separate from other cows' milk. Not uncommonly it curdles in boiling.

2. Rich feeding often induces a cow to wish to go to the bull, sometimes even when in full milk. In such cases she should be fed with butter-milk. *Kateela* gum soaked in water too is good for her ; so is chopped sugar-cane.

3. When a cow repeatedly rejects a bull, she should be drenched with *mahoa* spirits (one pint) before being taken to him, and give her molasses (*goor*) with her food.

4. When a cow falls off when in full milk for no good and apparent reason, give her *papeta* leaves and fruit, also white pumpkin (*kudoo*) boiled, or the gourd which grows, trained over the top of villagers' houses, called *kphra* or *komra*, boiled.

5. After difficult calving a pint bottle of beer is good for the cow every morning for some days. A $\frac{1}{2}$ tola of cheretta pounded and mixed with *goor*, formed into a ball, may also be given morning and evening.

6. When a cow is in great pain from calving, give her three or four grains of opium, and repeat if necessary.

7. Chopped sugarcane is good for red water as it appears in India in a mild form. See recipe 18.

8. Cows that are dry should have no grain, or very little, as they should be in rather poorer condition than usual, or they may be taken to the bull often without any result. She should have lots of grass and chopped chaff.

9. Chapped nipples should be treated by drying the teats carefully after milking, which is often the cause of the complaint, and smearing with goose fat or butter and a little wax melted together in bad cases; one oz. bee's wax, 3 ozs lard mixed, and while being cooled, $\frac{1}{4}$ oz. of sugar of lead and a drachm of alum finely pounded stirred in with it; before applying wash with hot water and dry the teats carefully. As soon as milking has been finished, this should be done.

10. *Mange* is cured when even a bad case with mustard oil and pounded gunpowder, or mustard oil and sulphur pounded up with it for less severe attacks.

11. *Lice and Ticks*.—These latter are common, in jungly districts especially, and give great trouble to cattle. Large vermin of this description are easily seen and can be picked off, but small ones are sometimes very minute and numerous and not easily disposed of in that way, and in that case there is a sort of jungle called in Bengali *Choitgara*, Hindustani *Ghatkanpatta*; the shrubs grow 3 to 4 feet high (I do not know the

English name of this plant), but the leaf of it pounded and applied, at once, sets all these vermin in motion and momentarily causes the cow great discomfort. In about 10 minutes she should be bathed, having buckets of water poured over her. This leaf is heart-shaped and has a rough surface, and is about the size of a man's hand. Lice and ticks are also removed by an application of tobacco water, but less efficaciously than with the above. Oil of any kind or lard rubbed in removes lice. Great patches of hair come away from cows infested with lice, and the irritation gives them little rest. Very often these pests are caused by bad condition; but cows well attended to and brushed daily should never be troubled by them.

12. *Diarrhœa or Scour* in cows is sometimes very troublesome to cure. The native method is to give the following simple remedies; unripe pomegranite fruit pounded and made into balls, one fruit made thus into four or five balls, is to be given every morning. Alum given in the drinking water. Chalk and flour; the best preparation of chalk should be made up as follows:—Chalk and wheat flour mixed into a paste with gin or strong country *mahoa* liquor, and black pepper added, made into balls of about an inch in diameter, two of which are given as a dose three times a day. Less is necessary for a calf, half of one ball for a young calf, and one for larger. Another recipe is, camella bark powdered 1 oz., prepared chalk 4 oz., laudanum 1 oz., and water 1 pint; 6 to 8 tablespoonfuls for a cow and two or three table-spoonfuls for a calf, according to size. A simple remedy sometimes useful for calves is the

shell of a fresh egg, being cracked it is forced down the throat.

13. *Fracture of Horns* is not at all uncommon, owing to cows fighting or other causes, this should be at once attended to in warm climates, especially where flies at once settle and lay their eggs, which hatch in less than a day and cause worms, and which are sometimes in difficult situations to be treated. This may happen wherever the blood falls or a sore place shews itself. Wash off all blood from where it may have fallen, but not off the horn, which envelope in a strip of cloth dipped in tar right down to where the horn joins the head.

14. *Superficial Worms caused by flies*, are most readily treated by camphor broken up into small pieces and applied to the part attacked, they then drop out or die very soon. If they have bored into the flesh, stuff the hole made full of camphor and turpentine oil, but camphor only is sufficient. I have found this better than carbolic oil or turpentine, which cause unnecessary irritation. Custard apple leaves pounded is what the natives use, and is in simple cases successful sometimes, but camphor never fails.

15. Intestinal worms may almost always be detected in the dung of cattle so infected. It is best treated with

Linseed oil	1 pint.
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Turpentine	1 dessert spoonful
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when there is no diarrhœa ; but when that too is present give the following :—

Till oil	1 pint.
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Turpentine	1 dessert spoonful
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16. *Cough* is a common complaint, especially if the cattle have been exposed or have been in draughts. Bamboo leaves given to cows cure them, if they are given at once ; if the cows will not eat, they must be given in the form of a ball.

17. *Redwater* is a blood disease, but there is a form of it that is not so, and chopped sugarcane given three times a day cures it ; sometimes it is accompanied by much prostration, then it is a blood disease, and in some instances it affects cows shortly after they have calved. It is caused by eating grass off undrained land, and from cows being badly nourished. The coat is staring and rough, and the skin dry ; the cow's back is arched, and her bowels get constipated, the urine becomes more and more red as the disease advances and then almost black. This is not a common complaint as a rule, among the cattle of the rich, but it affects those of the poorer classes.

Give the following mixture :—

Sulphate of magnesia	...	12 oz.
Sulphur ...	...	4 „
Carbonate of ammonia	...	4 drs.
Powdered ginger	...	3 „
Calomel ...	...	1 scruple.

Mix and give in warm gruel, after which a stimulant such as—

Spirits of nitrous ether	...	1 oz.
Sulphate of potash ...	...	2 drs.
Ginger ...	...	1 dr.
Gentian ...	...	1 „

given in gruel twice a day.

Another remedy.—Boil one oz. nitre in one pint skim milk, beat up the yolk of one egg, in from (according to animal's age) two or four tea spoonfuls of copavia, and boil together and give it to the animal, repeat next day if not cured.

18. *Swollen Udders.*—Foment with warm water and laudanum or poppy heads boiled in water, if lumps have not formed which can be felt; if lumps have formed, try and disperse them by applying good mustard oil or mustard oil in which has been mixed a little table mustard. Very often the mustard oil is adulterated, and it is always the better for having some table mustard mixed in it; mustard oil for medicinal purposes should always be of the purest obtainable. Rubinis camphor applied first, then mustard oil applied immediately over it is a very good remedy. The natives apply some lime and turmeric pounded together which is sometimes effective. The cow should be kept in her stall and not allowed to go out for either exercise or grazing.

19. *Hove or Hoven.*—A swelling of the stomach from inflation by gas or wind, is a common and rather dangerous disorder caused by greedily eating rank grass, or grass that has been subject to inundation, or from eating advancedly fermenting food. The swelling comes on suddenly and the animal grunts and groans with pain, the back is arched, and every sign of distress is apparent, till at last it sits down, and then rolls over, unable to move. Sometimes a fluid is discharged from the mouth and nostrils, and death is the result if not

attended to in time ; Rubinis camphor given twice in 20 drop doses at an interval of quarter of an hour ; then a quarter of an hour after the last dose give a purgative, or if an elastic tube be inserted, it may at once relieve the animal ; this elastic tube should be kept by every one who has cattle.

20. *For Colic* give a dose of 1 pint linseed oil and laudanum $\frac{1}{2}$ an oz.

21. If 1 pint linseed oil or a large dose of castor oil fails, then give :

COLIC BALL.

Cubels (kubaba)	...	..	4 drams.
Bishop seed (ujwain)	...	...	2 „
Red pepper (lall mirich)	...	...	1 dram.
Opium (opheem)	...	...	20 grains.
Venice turpentine (gund beroza)	...	...	2 drams.
Calomel	...	...	20 grains."

mix into a ball.

A man should be set to rub on each side over the place where the pain is, unless the cow is large with calf, when rubbing must not be resorted to.

22. *Cold, Hoose or Catarrh* is common enough, but often leads to other ailments so should not be neglected. Give for a large sized cow :

Epsom salts	...	...	4 oz.
Powdered ginger <i>sothe</i>	...	...	$\frac{1}{2}$ „

23. *For Poisoning*.—If the animal has been supposed to have eaten anything poisonous or has done so :

Epsom salts	...	...	1 lb.
Gruel or water	...	...	1 quart.

24. *Weak digestion* is often troublesome with some cows, not unfrequently large animals with big appetites and large milkers. *Aglæ marmalos*, wood apple or *bail* fruit tree leaves should be given, and salt and bran should be stopped. Tonic remedies should also be given to the cow.

25. *For Fever*.—Bleed if you know how to do so, and give :

Nitre powdered	...	...	1 oz.
Sulphur	...	...	2 „

or give the mixture alone.

26. *For Sprains or Strains*.—Henry's Hippacca well rubbed on the affected part is as good as anything, so is Henry's Thilum, which is milder. The former is very useful for *mange* also, and allays the pain from stings of bees or wasps or other insect bites most effectually ; or :

Sweet oil	...	...	8 oz.
Spirits of hartshorn	...	...	4 „
Oil of thyme	...	...	½ „

27. *For Wounds* the following is a very good remedy :—

Barbadoes or Socotrine aloes, <i>masubur</i>	...	...	4 oz.
Myrrh coarsely powdered	...	...	1 „
Rectified spirits of wine, <i>sarab ka arak</i>	...	...	1 pt.
Water	...	...	2 pts.

Let the above mixture stand for some 14 or 15 days and occasionally shake.

Do not sew up wounds, but keep clean. If inflamed,

apply poultices; if fungoid granulation appears, use mild caustic lotion, such as:

CAUSTIC LOTION.

Blue vitriol (sulphate of copper) <i>tootea</i>	...	1 oz.
Water	...	1 pt.

28. *Foot and mouth disease* is a very common disease in this country, and several remedies have been recommended, but after it once starts, little seems to be of any good but *good nourishing food such as can be taken in the form of gruel*. As soon as this disease appears, the best preventive is to dress the feet of all the animals with a solution of:

Carbolic acid	...	1 oz.
Water	...	1 qt.

Also a mixture of $\frac{1}{3}$ rd carbolic acid and $\frac{2}{3}$ rd tar, which is perhaps the best. Should the disease have started and flies have already attacked the hoofs and partitions of hoofs, use powdered camphor, or turpentine mixed with camphor, to dislodge them, and dress with Hippacea, which keeps the flies off. This disease is not fatal if care be taken.

29. *Inflammation of the brain and sun-stroke* are best treated by bleeding, and immediately dose with a large quantity of Epsom salts. Homœopathic belladonna ix, in 5 drop doses every three hours is also excellent

30. *Kanta*.—What the natives call "*kanta*" is hypertrophied papillae of the mouth. The papilla or rough portions of the tongue and cheeks become much leng-

thened and hardened, and this hurts the animal in eating. (The animal must be thrown by tying up its fore leg and tying a rope to its tail and pulling), when a native barber will shave off the excrescences, after which rub the parts operated on with salt. After this she should be forced to take a good quantity of salt every day for some days and have nourishing food and gruel given to her.

32. Care should always be taken when getting *linseed oil* from the bazar for medicine that the same is not boiled linseed oil, which is worse than useless.

33. *Cow Pox*.—Wash the udder with tepid water and a piece of cloth, wipe and apply butter or *ghee* ; feel that the udder is soft, and then milk off all milk (daily) after this operation, or the cow will run dry.

34. *Tonic prescription*.—Put a handful of *cheretta* into a bottle of rum—*arrack* (8 oz. or more of *cheretta*, not less) and let it stand for use ; 6 oz. is a dose for a cow, of which two can be given in a day or 4 oz. three times a day in urgent cases.

35. "*Batauree*" or a sort of *blind boil*, for which natives sometimes fire with a hot iron, may sometimes be got rid of by shaving off the hair over the part affected and applying strong tincture of iodine or Rubinis tincture of camphor. After the camphor has been applied, smear the portion with sweet oil, so that the camphor is absorbed, and this frequently disperses the boil, if done in time ; if it does not, it is far more merciful to use a knife or lancet than brand, which also disfigures animals.

36. *Sprains*—Sometimes resist treatment with embrocation, in that case James's blistering fluid applied after the hair is shaved off does good; but if that cannot be got, a beetle called by the natives *bagkeera*, which may often be seen destroying roses and other flowers which they eat ravenously, forms a very good substitute. These beetles are striped orange and black or yellow and black; collect a number of them, put them in a corked bottle in the sun and a yellow oil will exude from them; throw away the insects or they will get rotten. In the oil add a very little spirits of wine, and apply as a fluid blistering liquid.

37. *Rheumatism* is not uncommonly caused from cattle laying about the fields on damp ground, or having a damp floor to their stall, but sometimes it is brought on from bad food and bad water. In such cases the animal shews a disinclination to move, is sometimes lame; droops and does not eat well; there may be pain in the back or inflammation in some one or more of the joints. Give an aperient dose of 1 pint linseed oil; foment after that with warm water for half an hour, and rub well with mustard oil. Repeat the fomentation and rubbing with mustard oil morning and evening, and if a bad case, three times a day; cover with a blanket or bandage the part, and place the animal in a warm stall; care should also be taken that the food is boiled and may be given warm with benefit. The case may last a few days, or suddenly disappear; but it is liable to return again. It improves the mustard oil to mix it with a little table mustard in all cases when used

as an embrocation, and in its place hippacea can be used, or Elliman's embrocation.

38. *Weak Eyes*.—Wash the eye with a strong solution of alum, one part of alum to ten of water, or sulphate of zinc, or Golard's lotion.

39. *Lumpas* shews itself by a swelling of the upper jaw which prevents the animal eating. The animal also feels pain when you press the spot that is swollen. The proper treatment is to rub the place with salt and give 4 chattacks salt, 4 chattacks sulphur, 1 chattack camphor, 1 chattack of *cheretta* every morning. First give the medicine, then rub in the salt. Sometimes these symptoms are caused by worms. If there is no cure in ten days, then give medicine for worms; but during the course of treatment give good nourishing food in a soft state, such as gruel.

40. *Dislocations* and *Sprains* are sometimes well treated by experienced *goalahs*, but your best plan will be to get in a veterinary surgeon, especially if your cow is valuable.

41. *Constipation*.—"From one to two chittacks of Eno's fruit salt in a quart of warm water, and a quarter of an hour afterwards warm gruel; let the animal have no food till it is purged, and then give nux vomica IX., ten drops every three hours during the day, and soft food in small quantities.

42. *Hide bound* is caused by disordered stomach, and can be detected by the animal's coat looking rough

and matted: it does not eat well, droops and loses flesh, then the hair begins to fall off, water is discharged from the mouth and sometimes purging sets in. For food give *vahur dall* well boiled, with which a good proportion of salt should be given and a tonic of *chevretta*.

The skin of an animal thus affected appears hard and as if fast to the flesh. No cattle well cared for suffer from this disease. A very good remedy is to rub the animal with the following mixture :—

Mustard oil	...	...	2	chattacks.
Sulphur	...	...	1	ditto.
Camphor	...	...	1	ditto.
Spirits of turpentine	...	...	$\frac{1}{2}$	ditto.
Phenyle	...	...	1	ditto.

If the disease continues, bathe the animal, if not too weak, in tepid water with soap, and rub with the mixture after thoroughly drying.

43. *Lameness*.—Remove any foreign body that may have entered the foot or hoof, wash well with tepid water.

If there be signs of suppuration, poultice with linseed meal, and after the matter has been well let out and the part well cleaned with tepid water, dress with phenyle one part to ten of water, or one part of carbolic to fifteen or twenty of oil, to which add a little camphor to keep off flies.

44. *Irregular Teeth*.—Examine the mouth carefully, and if the tooth be higher out of position than the remainder, file down with a tooth rasp.

45. *Grain sickness* is caused by eating food that remains undigested in the stomach, such as coarse grass, dry food, and having an insufficient supply of water. Constipation helps it and completes the ailment, which, however, is generally curable by giving the animal large quantities of salt, which will cause it to drink much more than it otherwise would. In the meantime, the animal must be kept on soft food, such as gruel. It should have a purgative given to it of linseed oil, 1 pint, and laudanum $\frac{1}{2}$ an oz., or two chattacks of Eno's fruit salt in a quart of water. If the medicine does not act promptly, an enema should be administered of one seer of castor oil, one seer of water, and one dram glycerine. Should there be signs of inflammation of the bowels, the stomach should be fomented with a portion of a blanket and hot water unremittingly and with perseverance. If a surgeon be at hand he would operate on the animal, but no amateur could be trusted to do so, unless he had a good deal of experience. It is a complaint something like *hoven*, and is sometimes mistaken for it; but *hoven* comes on suddenly and grain sickness comes on slowly. In *hoven* the stomach is soft on the left side, and yields to the touch, sounds hollow on percussion, and the wind that escapes is foul smelling. If the left flank be pressed on in grain sickness, it pits and is hard like wet clay, and food is discharged from the mouth and nose. The animal stands and is disinclined

to sit down, grinds its teeth and grunts; it does not chew the cud; the respiration is quick and the pulse is weak and small. The disease may last three days. *Hoven* will not last so long.

46. *Fardel-bound* is an impacting of the third stomach caused by the animal eating unsuitable dry food and not drinking sufficient water. All the food, or a great portion of it, accumulates till there is a complete stoppage. The urine is high coloured, and the animal passes some liquid with hard lumps of dung in it which are dark coloured. If relief does not take place soon, inflammation sets in; the ears and mouth become cold, pulse small and thready; in some cases there is great stupor, in others great excitement. A purgative medicine must be given; Eno's fruit salt two to four chattacks in a seer of hot water and the dose repeated in fifteen minutes; or linseed oil one pint and $\frac{1}{2}$ a dram of laudanum and repeated till the bowels are cleansed. Foment the stomach with hot water unremittingly for half an hour every five hours till there be relief. Give the animal plenty of soft, warm food, such as gruel, warm soft rice, and the like, both day and night. This should be continued some days till no hard lumps are passed in the dung. The disease may run on for ten or fifteen days.

47. *Apoplexy* is distinguished by sudden insensibility and loss of power of moving. Give an enema of one seer linseed oil and one seer hot water, and pour cold water on the head from a height. If you believe in homeopathy, which is a good thing in such complaints,

try Bell. ix, and Acon. ix, alternately, in ten drop doses every half hour, beginning with Bell. ix. first.

The premonitory symptoms of this complaint are listlessness, protrusion of the eye balls and laboured low breathing. When the animal falls, then stertorous low breathing, and the pulse is full but slow. The animal struggles violently, and dies if not relieved.

Warbles is caused by gad flies piercing the skin of the animals in which, in hot weather, it deposits its eggs and is hatched into a fly, propagating itself again and again if proper steps are not taken. It causes ill-health and great discomfort to cattle, tunneling under the skin over a great space when in the form of a grub just hatched before turning into a fly. The place affected is in the form of a lump and should be taken between the finger and thumb and squeezed till the grub comes out ; then phenyle in solution should be injected into the hole. One cow being infected, the flies go on attacking other cows unless this treatment is resorted to.

48. *After Calving*.—In severe cases take :—

Carroway seed	...	...	$\frac{1}{2}$ chattack.
Aniseed	...	...	$\frac{1}{2}$ ditto.
Ginger powder	...	...	$\frac{1}{4}$ ditto.
Fenugreek	...	...	1 ditto.

May be given boiled in a pint and-a-half of beer for ten minutes, and given when cold.

49. *Yellows, or Jaundice*.—Boil for ten minutes the following mixture and give daily :—

Diapente	...	...	1 chattack.
Commin seed, powdered	...	...	1 ditto.
Fenugreek, powdered	...	...	1 ditto.
Water ...	...	...	1 quart.

Jaundice is not a disease, it is caused by other complaints.

50. *Bites of Mad Dogs*.—Burn at once with lunar caustic very carefully and severely, and repeat next day : see that no spot wounded is unburnt.

Hernia is a serious complaint, which requires a surgeon, who should be called in as soon as possible.

51. *Rinderpest, or Cattle Plague*.—A contagious disease of the worst type, called by natives "*Bosonto*" or "*Boshonto*."

Care must be taken to remove the animal infected on the very first appearance or symptoms of the complaint, which are as follows, and are divided into three stages, as may be seen by any casual observer. They are treated of in all books on the subject in the three different stages accordingly.

The first symptom is increased temperature, dullness, mouth hot and congested, throat congested, ears drooping, and there is a husky, short cough, the appetite is poor and thirst great, there is spasmodic twitching of the muscles of the back, hind quarters, and shoulders. The

bowels are generally constipated, rumination slow, yawning, grinding of the teeth and tenderness of the spine, and the pulse is much accelerated.

The second stage shows the animal fluctuating in temperature ; sometimes hot and sometimes cold ; the rumination ceases, respiration is hurried, there is a discharge from the eyes and increase of tenderness in the loins ; the animal lays down with its head turned to its flank, thirst increases, the fever is high, and swallowing very difficult ; the pulse is much accelerated but irregular ; the gums and mouth are red ; tongue furred, the dung covered with blood, and there is constipation ; the vulva and rectum are red, and tenesmus and protrusion of the rectum and vagina set in.

At the third stage there is excessive discharge of viscid mucus from eyes, nostrils, and mouth, accompanied with foul breath ; the mouth is excoriated and coated with yellow over the gums and edges of the mouth, buccal papillæ roof and floor of mouth, and occasionally the nostrils and eyelids. At this stage purging sets in, the dung containing hard pellets covered with blood and mucus, then there is a discharge of fluid matter accompanied with blood and apthæ which is offensive ; the skin and limbs generally become cold ; and there is difficulty in swallowing, accompanied by cough ; the animal becomes so weak that it lays down and cannot rise, it moans and grunts, the pulse becomes imperceptible, and the animal dies.

Cows often abort at the third stage. There is sometimes an eruption of the skin, but the disease is one and

the same. When the eruption appears it is generally in the hot season, and is considered a favorable symptom because the dysentric symptoms are then absent, or nearly so. This disease is mistaken by natives for small-pox, and when the eruption appears, it is called by them *matah*, and when absent, *andar-matah*.

The following simple remedy is recommended : give 2 chattacks Eno's fruit salt or 4 chattacks Epsom salts, or half a seer common salt in warm water, and repeat every hour till the bowels are relieved ; when purging and passing of blood has continued for more than twenty-four hours, give the following draught which has proved successful in many cases—

Camphor	...	...	$\frac{3}{4}$ tolah.
Nitre (sora)	...	...	$\frac{3}{4}$ „
Dhatura seed	...	...	$\frac{1}{4}$ kancha.
Cheretta	...	...	$\frac{3}{4}$ tolah.
Arrack	...	...	2 chattacks.

But when the diarrhœa has existed over twenty-four hours, add to the prescription, gallnut $\frac{3}{4}$ tolah, it should be given every twelve hours till purging ceases. For sheep and goats one-sixth part of the above dose is sufficient.

The homeopathic treatment of the complaint has been found very successful.

Preventive medicine, arsenicum album ; dose, 10 drops of the third dilution daily in a teaspoonful of water. If a large herd be thus treated, mix twelve drams in two quarts of water and give one tablespoonful

for a dose. *In case of an attack.* Bell. 3*, ten drops in a teaspoonful of water every two hours for twenty-four hours, and if the animal gets no worse, continue for two or three days longer, only give the dose every four hours, or as the symptoms decline, every eight hours.

If the attack increases in severity after twenty-four hours, give arsenicum album, third dilution, ten drops every three hours in a teaspoonful of water.

Supervention of other symptoms.—If the muscles twitch and jerk, and there are blister-looking patches as described, in the mouth, nostrils, etc., give rhustox, third dilution, ten drops in a tablespoonful of water every three hours; if there is no improvement, give arsenicum again, as before described.

When the lungs are affected and there is difficult and rapid breathing, with rattling in the windpipe, and cough, give phosphorous, third dilution, ten drops in a spoonful of water every three hours, for twenty-four, thirty-six, or forty-eight hours, after which return to the arsenicum.

Symptoms like hoven.—Give, if there is oppressed breathing and groaning as the chief symptoms, ammonium causticum, ten drops of the third dilution, every two hours till the symptoms abate; for weakness from diarrhœa give phosphoric acid, third dilution, ten drops three times a day.

External bathing and washing.—Wash all the affected parts with tepid water.

Diet.—During the acute stage give *oatmeal gruel* and *no other food*. When recovered, gradually return to the ordinary diet.

Supplementary directions.—Great cleanliness must be observed and careful attention to the sick animal. The litter must be frequently removed. A number of cattle are lost through mere inattention, and because the medicines are not properly given. A small horn is the best thing to give homeopathic medicine; it can be got from the chemists, and it should be kept very clean. The strictest care must be taken to keep the sick animal away from the others, and the offal should be burnt. The infected animal should not be returned to the herd or flock for, *at least*, one month or more after it has quite recovered.

51. *Malignant Sore Throat.*—Called by natives "*tolla*" is a most infectious complaint and very destructive; it is marked by the following symptoms: cold of a severe nature, like influenza, with loss of appetite, cough, discharge from the eyes, nose, and mouth. Ruminating is suspended, and there is a swelling of the glands of the throat, the tongue and the jaws are swollen, and there is inflammation of the lining of the nose and eyelids; there is difficulty in swallowing caused by the throat and glands swelling; the breath is offensive, and diarrhœa sets in; there is also difficulty in breathing, the tongue protrudes and is of a dark colour, and on it appear ulcerated purple patches; there is great weakness, the head is projected to facilitate breathing; the symptoms rapidly increase and death may

take place in from a few hours to three or four days. Unless the animal be valuable, it is best to destroy it, and then bury it deep in the soil. If any attempt be made to save it, the treatment should be much the same as that practised for diphtheria, washing the mouth and throat with a solution of electro-homœo medicine, 20 globules of Domfin to a small tumbler of water; and giving the animal inwardly tablespoonful doses of one globule of Domfin in six drams of water every ten minute still improvement takes place, then every quarter of an hour, and after that every twenty minutes, lengthening the time between the doses. Wet the swellings every hour under the neck with red electricity and white electricity alternately.

Calves are most liable to this disease, though grown-up cattle get it too, and it is now raging in a village close to where these pages are being written. The causes are blood-poisoning, from various causes, impure air and water, bad housing and bad feeding.

Immediately an animal is attacked, it should be removed to separate quarters, and the stalls and furniture disinfected most carefully, because this is a most infectious complaint, and it spreads rapidly. The above is the best and most effective treatment the author knows of, several cattle having been cured by it lately, while a large percentage of those under other treatment have died.

52. *Pleuro-pneumonia* is also a most contagious disease, and requires to be cared for accordingly. This complaint may come on suddenly or very slowly, and cat-

tle, sheep, and goats of all ages are liable to be attacked by it. It generally attacks cattle on damp land or in changes of weather, crowded herds, and in highly-fed animals; the temperature is increased, there is shivering, increased pulse, mouth hot and muzzle dry; there is husky cough and loss of appetite. In a day or two the fever increases, the symptoms before described increase and the breathing is rapid; the animal lays on the centre of its chest to cause expansion and facilitate breathing, and the ears and horns feel cold. The fingers pressed on the ribs cause pain, and in the last stage of the disease purging sets in. The disease must be noticed early to effect a cure; or only a portion of the lung may be affected and the animal may then recover if properly treated with electro-homœo medicine such as pectoral (1), one globule in a pint of water, a tablespoonful to be given every 10 minutes till improvement, then every quarter of an hour, then every half-hour, as the disease diminishes. If there be no improvement, pectoral (2) should be given in the same way, omitting the first remedy.

The animal should have red electricity painted over its sides over the region of the lungs when they are painful, and this may with advantage be alternated by painting with white electricity.

. The stable should be warm and kept free from draughts.

THE GOAT.

CHAPTER XIV.

THE goat cannot be, and is not by any means, below the notice of not only dairies but private homes, where it is a most useful animal. As before mentioned, its milk contains more nourishing matter than that of the cow, which only stands second to it.

Another great point with goat's milk is that it can be easily digested. In India there is really, perhaps, no animal so hardy as a goat; villagers in many places keep them in great numbers, drive them out in the morning, and let them pick up what they can in the jungles and on surrounding hills, where they forage all day long unattended, and when evening comes they return to their respective masters quite unbidden. They thrive wonderfully, there is little in the way of ailment that ever troubles them in the slightest degree: they suffer sometimes like all animals made more or less artificial with artificial treatment and food, which man chooses for them, not they for themselves.

Herds of goats may thus be seen kept by coolies which have never known a day's illness, driven off to the jungles during the day and returning home in the

evening ; these are of the common country breed and also of the *Jumnapari* or up-country breed, so well known in many parts of India, to which they are taken for sale.

These are the two best known breeds both in Bengal and up-country, as far as the North-West Provinces, beyond which is found the Cashmere and Angora goat.

The country goat lives chiefly on grass and herbs which it finds on the ground, and though it eats scrub jungle too, it is not necessary for it. The good speci-

What country Goats live on commonly. mens are much like that of the

English goat, but they vary very much in breed both in size and length of hair, some having beards, while others have none. This is caused probably from other breeds having been accidentally or purposely crossed with them ; the Jumna-

What Jumnapari goats feed on generally. pari goats, on the other hand,

are much larger animals, generally with large horns and with bodies which are formed more like that of a deer ; this breed feeds less on grass, and enjoys feeding on the leaves of a great variety of trees and bushes to which it reaches up to an almost extraordinary height by standing up against the stems of the trees.

All animals with cloven hoofs are more or less liable to

The disease they are most troubled with, consequent on improper housing. foot and mouth disease, and so are goats ; this being perhaps the complaint that troubles

them most, and more so when they frequent low-lying pastures and are housed in damp sheds with floors that

are not cleared daily of all filth. It is not only the contact of the animals' feet with this unwholesome mire, and their tongues with their coats which they lick to get rid of it, but also the vitiated atmosphere of such sheds that they live in that affects their constitutions and debilitates them, bringing on the above complaint; and it is not to be wondered at when one sees the squallid filth most domestic dairy animals are kept in by natives, *and* from want of supervision even by some Europeans in this country.

Goats, because they are hardy must not be treated carelessly, however they may be free from disease. Properly speaking the goat is an animal that is an inhabitant of mountains and hills, and in such places enjoys fresh air, and has not the habit or chance of standing on soft, muddy ground or on filth, but on good rocky ground or shingle, and on the face of precipices where no water can lodge. Goats in a wild state live high up on mountains; they make themselves comparatively snug and warm by finding nooks that shelter them in inclement weather, they delight in sunshine, and when the sun is bright, they may be seen basking or browsing in its rays. So it may be presumed they enjoy warmth. Being gregarious animals they flock together, especially when the weather is cold, or when they are at rest, and this may be usefully borne in mind by those who keep perhaps one or two goats, and not more, that, as they cannot keep themselves warm under these conditions, they should have a warm shed in the cold weather.

The milk of the goat has (in an early portion of this work on the value of the milk of dairy animals) been pointed out as being more nutritious than that of the cow. Puddings, cakes, etc., are far richer, if the same quantity of goat's milk be used (undiluted) instead of cow's milk. It can be diluted to the consistency of cow's milk, or less may be used if it is not desirable to make the substance being operated on liquid to any great extent.

It should be remembered also that the great value of goat's milk is not only that it is nourishing, but because it can be easily digested, and is therefore necessary for the sick and young.

There is a certain amount of flavour, or *goût* in goats' milk, to which there is a great deal of prejudice against its use, which is quite unfair to it; especially as there is much to recommend it to people living in towns where really good unadulterated cows' milk is difficult to get; such people could, with little inconvenience or trouble, keep their own goats for the milk, especially for children or for coffee and tea; and they would feel sure of its purity and of its nourishing quality for their little ones.

The use of goat's milk especially in places when pure cow's milk cannot be got.

The Romans kept large flocks of goats, and in England till very lately goats were reared in fairly large numbers. Large flocks of goats are kept in Switzerland and they are well tended and valued as most useful animals both for their milk, cheese, flesh, and agricultural

purposes. The cheese we often enjoy as being one of the delicacies of our table, "Roquefort," is made Roquefort and Gruyere cheese. on the continent, and especially in Switzerland, from goat's milk; and it is not certain whether Gruyere cheese is not an admixture of goats' milk with that of cows', though such is not generally considered to be the case.

Besides the varieties, or rather breeds of this animal, already treated of, two or three others are worthy of further mention as being indigenous to this country or its proximity; there are the Breeds of Indian goats. Cashmere and Thibet Angora goat, both with hair of a fleecy character, which is used in making fabrics of value, though for dairy purposes they are of less value than either the country or Jamnapari breeds. Whether the Jamnapari and Surat breeds are identical the author cannot confirm, not having seen what was ever acknowledged to be a Surat goat, which from some descriptions would appear different, as they are all said to be perfectly white, though in other respects, such as form, size, etc., they are much the same.

Then there are the Continental, English, and Irish Continental, English and Irish goats. goats; all more or less very like each other, barring that the English (pure breed, for they are much intermixed now) has a much finer coat than the others, and are considered to be good milkers, probably the best of

European breeds. One writer records three quarts to be the largest amount of milk taken from an English goat that he knew of; but this is an extraordinary instance.

This quantity can be quite equalled and exceeded by *Jamnappari goats*. The writer of. *Jamnappari goats, description* had in his possession a large flock of these, and they were not only good milkers but very handsome animals of their kind; quite ornamental with their peculiar markings, black and white, red and white, black, and one variety brown spotted with very regular markings on a lighter brown almost approaching cream colour. The majority of the Jamnappari breed are good milkers, but there are individual animals that give a much larger quantity than others. They are not so hardy as the common country breed, nor is the flesh of the kids of this breed so good. Being large eaters of foliage, they thrive best where they can be supplied with branches, or better where they can be driven out where there is scrub jungle. Hilly or high land seems to suit them best. The "billy" of this breed is generally a very large animal compared to the female or "nannie," but both sexes are much larger than the generality of country goats, and they seem to go on growing a much longer time. Some of these animals have immense horns, while others are almost hornless. Tall, long-bodied, long drooping ears, and bearded deer-like; as a breed they are much more majestic than any other known variety.

If you want a really good milk goat, and are so

situated as to be able to provide them with branches of trees or scrub jungle, or can get them driven to where they can feed on them, they are by far the best breed to keep in India, unless you have quite an exceptionally

The country or common good *country goat*. These are Indian goat. very fluctuating in size and

differ immensely, some districts and villages even having quite superior animals to adjoining situations. Some are short legged, so much so that the belly almost trails on the ground ; these are generally heavy-bodied creatures with great breadth, but not usually long. Others, again, are much more leggy and long bodied. These animals have short ears, and the difference between the Jamnapari and common goat is even greater than between the lop-eared rabbit and common rabbit in size and general looks. This is by far the best breed to rear for goat mutton and for kid's flesh for the table.

COLOUR.

BLACK goats are generally thought to give the largest quantity of milk, though as in cows it is held, and experience has proved, that colour matters very little indeed, excepting perhaps that a white goat or a white cow shew the dirt most, and have generally, if not always more delicate constitutions than those of any other colour.

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THE CHOICE OF A GOAT.

THE teats should be large, as also the udder ; the former should be wide apart and each pointing out-

wards, not inwards ; this causes the animal to walk with its hind legs wide apart, which gives it a peculiar gait very easily noticed.

From two to three years old is the best age to select goats at, for before that they give little milk ; they begin to give larger quantities of milk when they bear their second or third batch.

The age of a goat can easily be ascertained by its teeth. At one year old it has thirty-two temporary or milk teeth, these are rather pointed and all in the lower jaw. After this the permanent teeth appear as follows :—

2nd year	...	2 teeth.			
3rd	„	...	2 more,	making 4	permanent teeth.
4th	„	...	2	ditto	6 ditto.
5th	„	...	2	ditto	8 ditto.

Or what is termed a full mouth. These teeth are much larger than the temporary or milk teeth, and cannot be mistaken by an ordinary observer. After this, age can be less easily marked until old age sets in, when the teeth get loose, wide apart, and break.

The health can be judged of by the fact of the breath being in no way offensive, while that of a goat in bad health is so. Also by turning up the upper eyelid, when a bright red vein will be seen in the corner of the eye if the goat is in health, if it is a dull red the animal must be in bad health ; its gums too should be red, and its head should be carried high and erect, while

the eye is sparkling and bright. The nose and nostrils too should be moist. The only other advice that remains to be given in the selection of a goat is to have it milked before you.

The price of goats varies so much with regard to each breed that it is quite impossible to fix any price, though in this country they may be said (as regards the country breeds) to be purchasable at from 1 to 5 rupees, and Jumnapari goats at from 4 to 8 rupees, for a "nanny,"

Price of goats while probably you would have

to pay ten rupees for a good "billy," unless you happened to purchase several goats at one time, when you might get him at the same rate as paid for a "nanny." These creatures are, as a rule, very good tempered, though among the males you may find some very spiteful, bad-tempered animals. Be

Temper of goats. such of either sex, they should be discarded, as their progeny

will inherit the same defect.

A really good country goat will give one to one and a half quarts of milk; and if you can get one that will give one quart, you may

Quantity of milk goats give.

say you have a good goat; while there are Jumnapari goats that will give you quite double that quantity, that is from two to three bottles of milk. Whatever breed of animal you may keep, you will require to feed them carefully to get the full amount of milk from them. It may here also be stated that in some parts of this country goats, like cows, give much more milk than in others, which is

attributable to the locality being more favourable to them as well as the pasture; and it will generally be found that the inhabitants of such localities understand better how to treat their animals.

A GOAT HOUSE.

Do not tie up your goat in any open shed, especially in the cold season, they feel miserable in the cold all night, and consequently suffer; in the warm season, if the shed be an open one, rain may beat in, and they dislike being wet and comfortless. If you do not wish to go to much expense, you can easily run up a "lean-to" off the side of any out-house; and in such case would only have to build three walls instead of four. If it were a large, room you would put in barred windows, and a door, which would to a great extent save expense should you make a permanent building of brick and mortar; care should be taken that these windows should have *jhaps* of matting or some such material to save the goats from the cold in the winter season. For each goat there should be ample room calculated on, though in the cool weather they are fond of lying close to each other, but in the warm weather they feel the heat, and are perhaps as comfortable as they can be in a covered shed with well projecting eaves, which should be low down to prevent rain beating in.

The floor should be of masonry or concrete or Portland cement; so as not to admit of urine sinking into

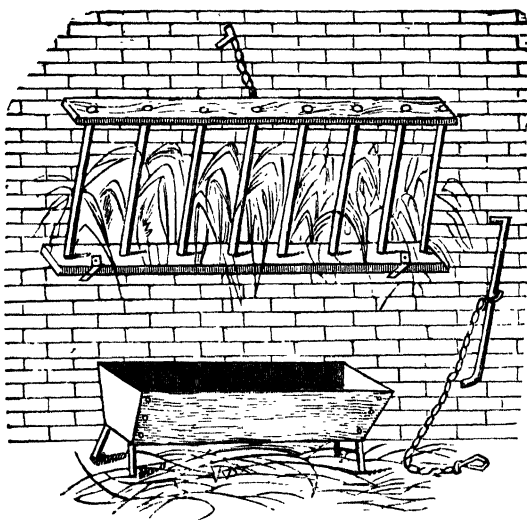
it, and also so that it can be well swept and kept clean it must be so constructed that should the building be at all wide, that it slopes down to the centre, where there should be a good drain. If the building be not wide (that is if not over, 6 to 8 feet) a drain may be made at one side of the building through its entire length, to which there should be a good slope, as nothing injures goats more than standing on a wet floor.

Some straw or cut grass should be given to them for bedding; this is almost always neglected, as it is thought sufficient by some people to give them a mud floor, into which all urine sinks, and being soft they require no bedding; but in a warm climate like this is (speaking generally of India) the stench which arises is in a short time unbearable, and their hoofs get soft, and are soon attacked by foot-rot, and after a time they suffer in constitution, and foot and mouth disease sets in.

There must be good ventilation if the shed be a closed one, and perforated tin or, better, zinc plates should be let into the walls, so as to admit of air without creating a draught; if there are no windows, the above is absolutely necessary; these ventilators may be with advantage placed just where there are mangers for the goats, and which are described below, and should be close to the ground

The manger may be a box, which is best made with its sides sloping outwards slightly, and not less than a foot, or even a little more deep, by 1' 6" long by 1' wide; above it should be placed a small hay rack for holding branches, hay, straw, or the like.

All this may appear like making much fuss about little matters, but such will not only be found a very nice and convenient attachment to a goat house in a town, where the animals cannot be sent out long distances to graze all day long, but will be absolutely necessary during periods of heavy rain, which goats



dislike very much. At the side of the manger and rack, is an iron rod fixed to the wall, to which is attached the ring of a dog chain ; at the end of which there is a spring hook to fasten to a collar round the goat's neck or to a head stall. This chain should be not so long as to admit of the goat getting within fighting distance of its neighbours.

FEEDING THE GOAT.

THERE are so many sorts of grasses and herbs that a goat can feed on, that there is no lack whatever of material on that score, so far as country goats are concerned, but the Jamnapari will require leaves or branches of trees and scrub, indeed, they do not thrive without these. However, they are easily obtained, for they eat almost all sorts of tree leaves and nibble up the tender twigs. If you are near a park or grass fields, country goats can of course be grazed; they should be taken to it and tethered, for roaming, as goats are liable to do, they do immense damage to crops and young trees, nibbling off all the tender shoots and bark. A piece of rod iron half an inch thick bent in the shape

of **P** suits the purpose of a
Tethering pin, to which the

goat can be tied with a rope or a chain similar to a dog chain. This pin should be made not less than one foot and a half in length.

It is by no means absolutely necessary that goats should be grazed; they thrive very well kept entirely in sheds, such as has been recommended under the head of the "Soiling system for cows," and it is also strongly recommended for goats; under this method they give very considerably more milk than when being grazed.

The question is now arrived at what foods are best to keep them in health, so as to enable them to give the greatest quantity of milk; and what foods are most milk-pro-

The best food for goats,

ducing? A certain amount of grass is necessary, but to this should be added corn, hay, and chaff; grain in itself is, though amply nourishing, not sufficient, and should not be given by itself but mixed with chaff as follows:—

Mixture of food for goats.

Chopped hay and straw	...	2 parts.
Bran	...	1 „
Oats	...	1 „

The above is a good ordinary mixture. Not too much must be placed before the animals at one time or they breathe on it and get disgusted of it. Care must be taken that goats which have run dry are not over-fed, as they do not require it; for them potato peelings are quite sufficient, mixed with the other ingredients, and leaving out the grain, that is to say if your animals are in good condition.

If goats are grazed, those giving milk require to be fed morning and evening, while those that are dry need only be fed in the evening. Those entirely confined must be fed three times a day, but better divide these three feeds into six. There should be regularity observed in the time of daily feeding, whatever hours may be fixed on, which is a matter worthy of the greatest care.

Regularity in feeding necessary.

: Goats are most fastidious eaters, and will reject food in any way soiled or dirty; it is the same as regards water, which must be given to them clean, and they prefer soft to hard water.

Fastidiousness of goats.

It can be well imagined how goats can be kept only stabled when it is stated
Goats kept entirely confined. there are several families who keep goats in London; these being fed on turnips, cabbage leaves, carrots, acorns, dried leaves, potato peelings, horse chesnuts, and weeds such as thistles, cut grass and dandelions, in fact, everything green.

Water and salt must not be forgotten as important items. In accordance with the
Water and salt very necessary. amount of milk the goat gives, the more she will require of them; for instance, a goat giving one to two quarts of milk will require to drink two or three quarts of water if she is kept on dry food, such as chaff. Next to food and water in importance comes salt, as it assists digestion and assimilation of food and prevents worms; it engenders thirst which induces them to drink water, and this increases the supply of milk.

When kept at home it is necessary to brush them down, which promotes circulation, keeps their coats free from
Groom and brush your goats in confinement especially. vermin, and makes it glossy; they enjoy it, and are most sensible to such kindness.

Foods that produce the greatest amount of milk are rape and cotton seed; then
Foods that produce the most milk. come lentils, beans (which do not thrive in this country generally), peas, clover hay (which is imported), bran, and oats (but our oats are very poor, and they should only be calculated on when

well cleaned and made into meal). Clover hay is considered the largest milk-producing food, mixed with oats and straw. Dry food augments the consistency of milk and adds to the weight of stock, which has been ascertained by experiments tried in England, *vide* "Milk Journal" of 2nd September, 1872. Indian corn is nutritive but engenders fat, and should be mixed with peas; in this form it is excellent, but the peas should be split, or better still coarsely ground, as also the Indian corn. Peas induce milk, and are nourishing and full of nitrogen. Linseed and rape cakes are fat-producing, as well as good for the production of milk, but they do not seem to act so beneficially in the latter way with goats in any marked degree.

MILK AND MILKING.

GOATS' milk, as before said, only requires to be known better to be appreciated. It is sweeter and more nourishing than cows' milk as well as more digestible; boiled and used for coffee or tea it is delicious, giving it quite a creamy appearance, and when diluted with half the amount of water it is not even then sky-blue as cows' milk would be. Butter made from goats' milk cream is of an oily consistency, and not equal to cows' milk butter. Cakes made with the milk are excellent.

Goats' milk requires only to be known better to be appreciated.

Milk cream butter.

Of milking, nothing more can be said than what has been already written with regard to the milking of cows;

Milking, sieving and stripping.

nievling should be always adopted, then *stripping*. That is, first the goat must be milked, seizing the teats one in each hand and closing the fingers uppermost first, and those lowest last, drawing down the hands gently and in alternation, then spring each hand up one after the other to renew the operation. Considerable force being used upwards in seizing the teats is necessary to act on the milk glands, such as one may see by a kid butting her mother as it were with the mouth to get down the milk. *Stripping* is practised to take away the last drops, and is done with the forefinger and thumb, much after the manner of *nievling*.

It is necessary that goats be milked more frequently than cows, as their udders cannot expand in the same degree comparatively speaking as that of cows, therefore they should not be milked less than three times a day (for the first three months after they have kids, at least).

Regularity in milking is as necessary as in feeding, and is of the greatest importance; nothing affects the quantity of milk so much as this, except the quantity of food supplied. It must be borne in mind that the goat's udder being comparatively small, as soon as it is full the secretion stops and is renewed again the moment all milk is drawn off; while in the cow's udder when it is full of milk it goes on distending very considerably; this is a matter not generally known and deserving of attention.

Goats should be milked more frequently than cows, and the reason why.

Regularity in milking necessary.

Violence must not be used in milking, or even harsh speaking, as it will generally be found a goat will have the best of it.

Violence, bad effects of,

Milk should be first strained and allowed to cool, it then gets rid of a great deal of the *gout* which is said to be so objectionable to some people.

Milk should be kept for a short time before being used

It may not be out of place to say it is necessary to keep goat's milk, like cow's milk, in shallow wide-mouthed vessels ; and that all such when emptied of milk should at once be well scalded with hot water and carefully wiped of every particle of moisture or greasiness. Goat's milk often curdles in boiling, so it should not be boiled, and it is not necessary.

Do not boil goat's milk.

BREEDING.

GOATS in this country, especially when they have lots of ground to roam over, always breed twice a year ; the period of gestation being five months. In England they breed but once a year. In India they have no fixed time of breeding, and most frequently produce two kids ; but less commonly one, three and four, and of these numbers one and three oftener than four.

Goats breed twice a year in India.

They begin breeding at from six months old, but this should not be allowed, as they are not fully developed, therefore such mothers as breed at an early age are stunted ;

Degeneracy from allowing them to breed at an early age.

and it is only marvellous that goats are not much more degenerated than they are: that they are degenerated few persons will question, so if you wish a good stock of goats, you will have to get the best you can (of the common species) and improve their progeny. The Jumnapari breed have been better cared for and have degenerated in a less degree; but even these are much improved on by carefully preventing them from breeding at too early an age and by selection and "in breeding" being avoided.

Four kids or even three should never be allowed; if breeding for stock it is best
The number of kids that should be allowed to such goat. to keep only one kid, and to use up the rest for table purposes, as milk kids. These animals give no trouble in producing their young and require little, if any, attention in particular.

Before parturition they should be sparingly fed; but
Management in breeding during the time of pregnancy they require generous food and lots of it.

When the goat, known to be in kid, bleats a great deal and her udders fill out and shews signs of restlessness, she should not be taken to graze; she should be placed in a stall, not tied, but loose, with some tepid water and a lump of rock salt beside her and left to herself on a bedding of straw. When she has produced her kids, she should have a bran mash made of hot water and bran, and it should be given to her while warm, and though the kids may suck, there

should be some milk drawn off, which lessens the pain : if the kids cannot suck off the milk and the teats are found blocked up, foment with warm water till the udder is softer, and try again. If milk cannot be obtained by the kids for some time it does not matter, as they do not require it for several hours.

Sometimes there is a substance in the kid's mouth when born, and to remove this
Attention required to the mouth of the kid when born. a rag wetted in tepid water being placed over a finger, the mouth should be wiped out with it ; if the kids do not find the teats, they should be held to their mouth once or twice, after which they require no teaching. For the first two or three days the milk is not good for use, except for the kids, being of a yellow colour and of a thick consistency.

As the kids grow, they should be fed with peameal and milk, or oatmeal and milk,
Feeding of kids as they grow. on which they soon develop into fine animals.

Should it be desired to obtain as much of the goat's milk as possible, sometimes the
Artificial feeding of kids. milk is skimmed and given to them in a bottle, such as a sucking bottle, or in a funnel with a piece of leather tied over the end of it in which a small hole is made. When the kids are able to drink milk out of a plate, it is thickened with peameal or oatmeal.

THE HE-GOAT.

It will be a matter for the reader to consider what purposes the male kids are kept for. If for the purpose of fattening, they should be castrated at an early age, say at three or four months old. Mussulmen, and village barbers especially, can perform this operation: and at the early age recommended, the animals soon get over it.

Goat mutton, let it be called, is only second to mutton when the goat has been carefully fattened, that is to say regularly and steadily fed up by degrees, and at no time neglected during the entire process of fattening.

Begin by giving your goat $1\frac{1}{2}$ lbs. of gram, or say 12 chattacks or even a larger quantity of oats, but you must bear in mind oats are not so fattening as gram; and a gram-fed goat will make better flavoured mutton than those fed on oats. In starting feeding, a smaller quantity of gram must be given, for to give more is absolute waste, as it passes away in the evacuations; and sometimes the animals get surfeited and fall ill. Later, as the process of fattening begins, the quantity of gram should be increased to one seer or a seer and a quarter, or more, according to the size of the animal. Natives, not unfrequently, in paddy-growing countries feed up their *khusees* on rice, which is not very fattening, but the

Castration, when it should be performed.

Meat production. Goat mutton, the value of.

Gram and oats to feed up, grain for meat production.

mutton has excellent flavour and the fat is very white.

Indian corn, Indian corn causes the fat to be more or less of a yellowish tinge.

When it is recollected that a good fattened goat brings a price of 5 to 8 rupees, many people would think it not beneath their notice to have a few goats, which would repay the entire keep of their parent stock, and considerably more if carefully tended.

Price of a fattened goat.

Many in India enjoy what they suppose fattened sheep mutton, while in reality they are eating fattened *khusee* or goat mutton; which has very little, if any, odour of the male animal left in it, that is if it has been castrated at an early age; those operated on too late in life retain the defect to a certain degree.

The ancients valued the flesh of the kid and horn very highly may be seen by the many times it is mentioned in the Bible, as also in ancient works. The mode generally adopted in slaughtering almost all animals in this country is by cutting their throat, and is the best as regards goats, instead of felling as in killing oxen.

Should you desire a he-goat to breed stock from, you should choose the best looking one you can, one from good milking parents, as large milkers generally follow in hereditary lineage. He should have no blemish of any kind, and should at an early age be kept separate from the flock of females till over a year or a year and-a-half in age.

DISEASES.

THE diseases of goats are few, and though much like sheep in other respects, the latter are subject to several diseases to which goats are not. Disease when engendered is generally from neglect, and in this country they have fewer ailments than elsewhere. Below will be found a few prescriptions for the commonest complaints.

1. *Diarrhœa*---

Sweet spirits of nitre and brandy, equal parts—			1 table spoonful
Epsom salts	...	...	$\frac{1}{2}$ oz.
Ginger	...	...	$\frac{1}{2}$ drachm.

2. *Dysentery*—

Prepared chalk	...	...	1 oz.
Ginger	...	...	2 drachms.
Opium	...	...	$\frac{1}{2}$ drachm.
Peppermint water	...	...	$\frac{1}{2}$ pint.

Mix well and give one or two spoonfuls a day, shaking the bottle first.

3. *Constipation*.—An ounce of table salt often has the proper effect, or—

Epsom salts	...	...	$\frac{1}{2}$ oz.
Water or gruel	...	...	1 pint.

4. *Catarrh or influenza*.—Keep warm and give—

Epsom salts	...	...	2 oz.
Ginger	...	...	1 $\frac{1}{2}$ drachms.

5. *Foot-rot* is a disease in which the outer coating of the hoof outgrows the frog.

The hoof must be well pared of the diseased horn, cutting deep, wash with chloride of lime and bind up with a rag dipped in tar, or the following lotion applied instead of the tarred rag:—

Sulphate of copper ...	... 4 oz.
Sugar of lead ...	... 2 „
Verdigris ...	... 3 „
Saltpetre ...	... 2 „
Turpentine ...	... $\frac{1}{2}$ pint.
Oil of vitriol ...	... 10 oz. by weight.
Water ...	... 1 pint.

The goat must be kept in a dry place. This disease can be prevented by examining the feet from time to time and paring the *hoofs* :—

6. *Garget or inflammation of the udder* may be easily ascertained by seeing if the udder is distended and hot, and if the goat will not let the kids suck. Keep the goat separated from her young in a warm shed. Then give—

Epsom salts in hot water ... 2 oz.

and bathe the udder in hot water and salt.

7. *Sore teats* should be treated just in the same way as that recommended for cows. .

8. *Poison*.—Give Epsom salts ... 2 to 2 $\frac{1}{2}$ oz.

9. *Lice* are treated in just the same way as recommended for cows.

10. *The administration of medicine* can be accomplished with any spouted vessel, such as a tea-pot, but the medicine *should be poured down the throat slowly*, for if it is too rapidly administered, it remains in the rumen, where it lays inert.

PIGS.

THE pig in this country is considered one of the filthiest of animals, but that he is forced to be so, there is no doubt whatever. He is attended by the lowest caste of men and *made to find* a living, instead of a living being supplied to him. Not only pigs, but other animals badly treated, and thus hungry and uncared for, of necessity *adopt* habits which are not natural to them, and pigs more naturally than others, being omnivorous by nature. The pig in England, Ireland and the Continent is considered one of the most valuable adjuncts of the dairy, in fact almost a necessity to make ends meet, and on him is used all the whey, butter-milk and skim-milk which cannot find a market. To keep him is not only a matter of economy, as he is a source of profit when made into fresh meat, bacon, ham and sausages. If it were well known that a dairy piggery was well cared for, and cleanly kept in this country, the production and use of pork in its many forms would be much more general than it is at the present day, owing to the just prejudice of the public to unwholesome food.

In other words pork would be gladly sought for as beef or mutton is, if pigs were properly treated and kept by responsible persons: persons whom the Government should hold responsible.

The pig being in no way particular is ready to eat anything that has the appearance of food, and yet, remarks one of the standard writers on English farming: "there is not one of our domestic animals which so quickly and abundantly repays such good wholesome food as may, and if possible should, be given to it."

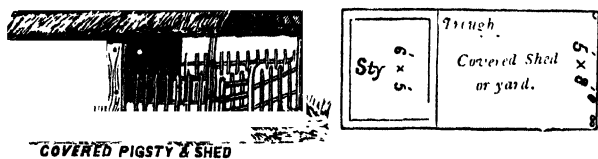
Every home that has a fairly large vegetable garden can yield what is here required. Cottagers at home consider this their most valuable and paying animal because it is easily kept on the leaves of cabbages and cauliflower roots, &c., and gives a splendid return. The inside meat such as the liver and "scraps" and trimmings of the hams are used by them, the bacon and the hams are sold, if properly cured, at a handsome profit. The extent of return from pig-keeping depends a good deal on how they are treated and cared for. A pig, as well as any other animal requires to be well treated (the Irish even make him a pet of the family; but it does not necessarily follow that such must be so). But let it be said that few animals are more susceptible to kindness than the pig, even though many people consider him a stupid brute. Who has not heard of the "learned pig." One thing is well known, he is easily taught and easily distinguishes who has been a kind and an unkind master, and even the mere distinction between one who is kind and another who is indifferent.

From the above remarks it may be gathered, it is the writer's intention to say that a pig treated kindly will yield a larger amount of good food than one indifferently treated, and what is more, he will fatten more quickly.

We now come to the subject of the sty for a pig or two, or the piggery for a larger number.

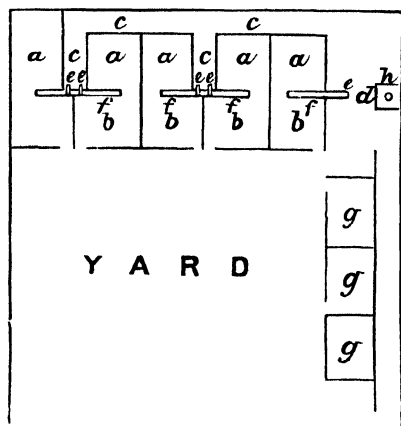
THE STY OR PIGGERY.

For a pig to thrive and be fattened at the least expense, it is necessary he be well housed and sheltered, protected from the sun, heat, rain, cold and wet. A pig is almost hairless, he has bristles only at comparatively long distances apart, and therefore feels the cold and wet more so than most animals, so that the floor he lays on should be dry. A space 5 feet by 6 feet will suit very well for one pig, with a building over it just like a dog kennel made with walls of boards or branches of trees fitted together so as to join up, but the roof of this being comparatively low, requires to be thatched to be cool. The floor must be of bricks placed on end, the interstices being joined with mortar, or it may be *pucca* or concrete. A floor not thus constructed soon becomes uneven and water lodges in it, and the animal cannot thrive in it even though it is supposed pigs like filth. The roof of the pig-sty should extend over the feeding trough and also over the yard. Below is an illustration of an easily built sty and yard of this description :—



The piggery for several pigs is supposed to be a more

complicated structure, but is really little more than this multiplied, with one yard and several pigsties, also a passage to convey food to the animals.



THE ABOVE IS AN ECONOMICAL STRUCTURE.

A a a a, Sleeping apartments 10 feet each way; *b b b b*, the outer court; *c c*, the feeding passage, running all round the building to *e e e* the spouts into which the food is poured into the troughs *f f f*; *d*, the food-preparing house with *h*, a furnace; *g g g*, stews the farrowing house for sows, these are 10' x 10' and have no feeding passage; the roof should project over the trough.

This is an approved plan of an English piggery which should do very well for this country also. Being commodious the pigs could always find shelter in the rainy season and in fair weather occupy the yard. But be it pig-sty or piggery, the floor should be well sloped to drains to admit of carrying away all water

BREEDS OF PIGS AND THEIR MANAGEMENT.

I do not think any one would advise the breeding of the country pig, which is the nearest approach to the wild pig that there can be. It is well known that the more cultivated the animal, the sooner it grows to maturity and fattens, and also that the fat is not grown inwardly but outwardly, and dispersed in the flesh. On the other hand the nearer the animal is to its original wild state, be it pig or ox, the longer it takes to mature and fatten, and fat is generated inwardly. The China pig ; a small white animal is better than the country pig ; but the best are the English breeds, which are divided into large and small ; black and white ; Berkshire, Yorkshire and other breeds : some variety of which can be procured from shipping coming into one or other of our seaport towns in India ; or the more extravagant plan of importing any particular breed may be adopted.

There is little good in getting old stock, the best age to get them at is when they have not yet had a litter, and they should be bought of the largest size. The broad sow should be long but broad too, not flat, and she should be wide across the loins with a great number of teats.

Two litters are as much as a sow should be allowed to have during a year. Early breeding is a great drawback to these animals, and if they breed young they soon degenerate. A sow remains in young four months.

It is best, in India at least, never to let pigs graze unless there are enclosed fields.

When a pig's litter varies in size, she is getting too old for breeding purposes, and should be fattened for killing. Boars at the age of two or three years are fattened and killed, because they become dangerous to sows as they grow large.

From the time a pig takes the boar, she should be very moderately fed, till about three or four days before she produces her litter, when she should be fed on bran scalded in water, and if skim-milk or whey or butter-milk can be given her with it, so much the better.

At this time they will be found dangerous to go near unless the attendant has been kind to them; the food should be laxative, as if it is not, so the milk will not come freely and the urine will be checked, thus endangering the life of the sow and her litter. She requires no interference, and sometimes the young will all be born in half an hour, the number of a litter being from one to sixteen and over; if there be not a teat for each, a little milk given in a cup to the one left out will be readily drunk; a baby's feeding bottle also suits admirably. The afterbirth should be thrown away, as eating it, which they do if allowed, induces the mother to eat her young, which sometimes happens. Any dead young ones in the litter should also be removed for the same reason. The pig should have some exercise daily if only by being driven about the yard. When the young pigs are three weeks' old, the boars of the litter should be castrated, because at this age they soon

get over it. At a month old they can well eat without any care from the mother, who should be separated from them. Milk skimmed, butter milk, whey, and meal, is what they should be fed on, and the diet of the mother should be improved when the young are four days old. Should a soreness appear on the tail of the young pigs, it should be touched with lunar caustic, as if it is allowed to extend to the root of the tail nothing known can save them.

Young pigs should be rung as soon after weaning as can be, it should be done before a meal, the pig being held, a wire sharpened at one end is driven through the nose and the ends twisted, which is an easy matter, as it should not be thicker than a coarse needle.

This prevents them from rooting or poking each other, or driving their bedding about, and as soon as they have eaten they rest. Care should be taken that the ring is not put too high up in the nose, as that produces a disease called "snuffles," and the pig breathes loudly and heavily and does not fatten.

The dairy farmer has the greatest chance of succeeding in fattening pigs on dairy produce and meal at a cheap cost, but it does not follow that others cannot do so also. Rice-water and rice fattens a pig, though there are other things that are better, and when milk is not obtainable, rice-water may be used in its stead, mixed with crushed Indian corn, barley-meal, or oat-meal coarsely ground, but all meal must be scalded before being given to them. Another very necessary thing to

give them is some charcoal, in a corner of the sty to eat when they feel so inclined. It is best to keep pigs separate when fattening, and precaution should be taken that they at no time escape from it.

Pigs' ailments are but few, and fortunately so, because they are bad patients to administer physic to, as they scream so much, and if given to them at the time they are screaming, they are liable to be choked.

It may be here said that the best care is prevention in the case of the pig, more so than in that of any other animal.

THE POULTRY OF THE FARM.

IN this chapter it is intended to give only a few notes on poultry as being attached to the farm; a source of profit in addition to the cow, the goat, and the pig. For particulars on poultry keeping, the reader's attention is drawn to the "Indian Amateur Poultry book." The ladies of the house may fear the cattle, but of the poultry the same cannot be said; if they have any inclination to love the farm yard, they will be sure to make pets of the poultry.

The poultry of India, though much inferior to imported breeds are by no means to be despised, for they are a hardy and paying stock for farming; easily reared, they can be kept for laying eggs, as well as to supply the market with meat, whereas English and other imported stock require considerable more care, and no more would be obtained for their eggs, at least for food purposes.

It is true, however, that a good imported fowl properly fed for table purposes, entirely leaves in the shade the Indian varieties, of whatever breed; because the former fatten on and in the flesh, whereas the latter fatten internally.

Fowls must not be kept so as in any way to interfere with cattle; as before mentioned, their droppings and feathers cause colic.

Ladies will find that keeping fowls is an economy, because so much that is wasted and thrown away can go towards their feed. Scraps of food of all sorts are useful to feed them on.

Now comes the question of pure breeds, and how could they be made to pay. This depends much if there is a demand for large and pure bred fowls. At the present day, in India, there is no such demand, as there is in England, America and Continental countries, though they do repay one for household purposes, by being far away the finest table birds, and lay the best and largest eggs that can be got.

When there is "a rage" in any of the former mentioned countries for a special breed of fowls, extraordinary prices are sometimes paid, and in proof of this there are some striking records: one of which may be mentioned here, *viz.*: £1,000 was in one case known to the writer netted in one season alone and from one flock.

At some not very distant period, Anglo-Indians will probably shew they are not backward in having

good stock but that time has not yet come. As the barn-door fowl, *for commercial purposes*, surpasses prize poultry, so does the Indian fowl, but they must be good country breeds of large varieties, which are just as hardy and productive as the smaller sorts. If the finer imported breeds are reared, they must be bred for fanciers, chiefly, to bring fancy prices for stock, and for eggs to breeders of fancy stock.

The labor of keeping fowls is not great, but it interferes with the other duties and should be the special province of the mistress of the house.

The hen-house should face the south, if it can be made to do so, not north, at all events, as then in the yards they get little sunshine besides which the house should be warm in the cold season. Hens in India ought to lay well, in the plains especially, all the year round. In the hills sometimes they seldom lay in the cold season by reason of it being nearly as cold as in northern countries.

The feeding of fowls should not be neglected, as they lay best when fed twice a day. They should be fed in the same place and at the same hours both morning and evening. On other subjects regarding fowls, the reader is directed to the Indian Amateur Poultry book which gives the fullest information.

Many residents of India may have seen farms at home, and possibly lived on them, and those who have, can say that a flock of fowls always adds a charm to the place and will preserve the "look" which farms from

time immemorial have had of crowing, pecking, fighting, funny, "rag-tag" poultry.

There, should also be the fat goose, the gobbling turkey and the ever noisy guinea-fowls. What Englishman, Scotchman or Irishman can say there is not a charm in the sounds of a farm-house? The goose and the turkey can be fattened on the farm as cheaply, or more so, than anywhere else, and give a handsome return in their good season. So long as there is a Michaelmas and a Christmas, so long will the profitable fattening of geese and turkeys pay the farmer, and the farm-house cannot afford to part with these familiar objects or as they may be called ornaments.

RABBITS.

RABBITS are not necessary to the farm, but the young farmer who is just growing up to the idea that he must have some other animals than cows to look after, can with benefit bestow some of his time, when not otherwise occupied with some profit to himself, to these little quadrupeds. Their food costs little, and fancy rabbits bring fancy prices, so the farmer may add to the amount of his total by keeping rabbits.

The keeping of these pets and the tending of them engenders habits of care and attention to the wants of the lower animals.

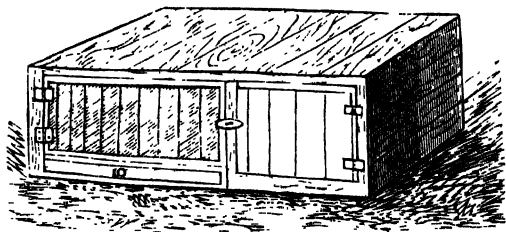
THE COMMON RABBIT is of various colours, grey, mouse, fawn, white and black, or piebald. Bred for table purposes, they afford a change, and if they are well fattened, they are a delicacy.

Rabbits should be short legged and large bodied, as such are supposed to be the best breeders. Hare-coloured rabbits are much esteemed by some, but those mottled with black or yellow are delicate in flesh, while the black and greys are most like the wild variety in flavour.

THE LAP-EARED RABBIT, or what is called the fancy Rabbit, should increase in value with the length of his ears and the dewlap. The ears should be measured from the tip of one to the tip of the other, across the skull *and should not be less* than 14 inches thus measured, (sometimes they measure 16 to 17 inches). They should also lap down or fall down in a graceful manner. The dewlap is only seen on those that have attained their full growth, and extends from the jaws on either side to the neck and down it.

The back of this fancy variety is much arched and it holds its head down.

Hutches and Houses for rabbits are made in many forms, the simplest of which is here described :—



Nothing can serve the purpose better though there may be improvements made in ornamenting.

A box hutch constructed like the illustration would serve for a few rabbits, according to its size, but if several are kept, they must have more room, as fresh air is very necessary to these animals and if they do not have it, they suffer from a disease called *Snuffles*, which is fatal. Bad smells and draughts should be avoided, and, not less so, wet or damp floors. The box should be constructed with two compartments, one for breeding and the other for feeding, the former having a door-hole cut to lead into the latter and to which a door should be attached. The feeding compartment has a door also with wires to the front, and a drawer below to take out without opening the door, for the purposes of cleaning. All corners and projections inside should be tinned as the animals nibble, and are very destructive; for instance the door-hole between the two compartments must be tinned round the edge, and also the front, below, above, and beside the bars. When a room is made for rabbits, it should have a Portland cemented floor, which should be *well sloped to a gutter* to carry away all urine, and the room must be well ventilated.

When the doe is expected to produce her young, the buck must be separated as he is, at such times, if not always, given to cannabalistic habits of which nothing can cure him, for as soon as the doe's progeny appear, he devours them without further ceremony. This must be carefully kept in mind.

The feeding and fattening of rabbits must now occupy our attention. Almost all sorts of green food will be

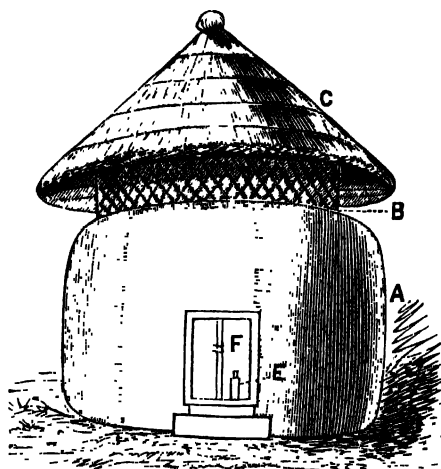
greedily eaten by them, but it must be borne in mind that being artificially kept, they must not have too much of it. Leaves of trees with a few tender branches, turnips, carrots and leaves of all sorts of vegetables suit them; too much, however, deranges their bowels, and to avoid this, they must be supplied with dry food, such as grain, dry grass or hay; the best way is to feed them three or four times a day, giving a small quantity each time, as they waste much food, and it is more natural that this should be done than giving them a large quantity in the morning and evening only. They must be about three to six months old when in prime condition to fatten, and must, when fattening is once started, *never* be allowed to fall back, or in other words they must be regularly improving. To fatten rabbits lessen the quantity of green food and increase their grain by degrees and give them as much as they can eat without causing waste. Mashed grain is best for them; such food as gram *chenna*, peas *muttur*, that called *kabli muttur* is the best, and oats *jay*, given occasionally for a change.

PIGEONS

ARE ornaments to the farm and house, they give no trouble whatever, and do not poach on other people's land, as they are often accused of doing, if they are properly fed. Like rabbits, they are the pets of children who can add to their pocket-money by rearing them. Fed properly, they do not fly far from their homes and attend their young as they would not otherwise do, and they fatten quickly. Thus kept they repay the

breeder, especially in India. Their chief enemies are hawks, which have to be from time to time shot. Their next worst enemies are cats, but their house should be so built that a cat cannot get at it. It should be constructed on poles, each pole surrounded with tin, so that cats cannot climb up to it. There are such heavy pigeons, as those of the "Seraji" breed that cannot fly up to such lofty places; for these, lower structures must be made and built in such places as to overcome this difficulty as much as can be.

Such a structure may be made in the form of a low tower in a circular form. This sort of building has been found to be most serviceable for such a breed as these which cannot fly higher than three or four feet off the ground.



The above illustration of a pigeon house is thus made. A wall 2 feet thick of brick and mortar or mud with holes for nests inside, sloping down to the back to

prevent eggs from falling out. These holes are 6 feet by 6 feet, by 1 foot 6 inches, in parallel rows 6 inches apart, both from the upper row and that next to it.

B. This is game mesh or bamboo lattice-work and over all is C, a thatched roof, supported by posts stuck in the wall, F is a small door with steps leading up to it, and E a small trap-door which is kept open all day but closed in the evening, the larger door only being used for sweeping out or attending to the pigeons inside. "Serajis," and "Runts" which are much like them but smaller, would thrive better in a house of this description. "Sky-tumblers" are amusing, because of their wonderful flight, but not unfrequently suffer from being attacked by hawks. "Archangels," "Nuns" and "Owls" are both graceful and amusing, but "Runts" and common pigeons are the most profitable to keep. "Pouters" are very handsome, but also very difficult to breed because they make bad mothers. "Ground tumblers," I do not think any European would care much to keep, as their evolution of tumbling on the ground being involuntary seems to give them pain and looks too like that of a bird dying. Of other varieties, there are "Trumpeters," "Dragoons," "Carriers" and a great variety of others, not forgetting the pretty "Fantails."

There nests must, under any circumstances, be well apart or, gentle as they may appear, they fight frequently, and when they have these free fights, destroy the eggs and young of their neighbours most ruthlessly.

A number of *chatties* put round a room in rows, and

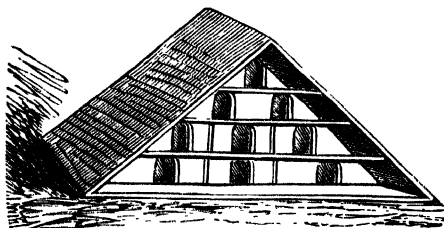
one above and between the lower row is a very good way of making a small room into a pigeon house. In this way a succession of earthen *chatties* can be put one above the other in rows, putting up a thin post here and there to keep them in position. A barrel divided into compartments and placed on two poles makes a very good pigeon house, but the barrel should have some thatch over it, and the posts have tin put over them to prevent cats from climbing up.

The pigeon fancier will do best to get his pigeons when they are not quite full-fledged, then they can feed themselves, but are not able to fly away. Pigeons lay two eggs, which are laid one day after the other, and are hatched in seventeen days. Various breeds lay more or less frequently, as the health of the birds affects their laying. From five to seven hatches of eggs are laid in the year.

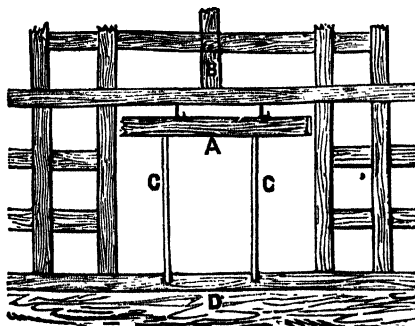
All sorts of grain are good for pigeon's food, but peas are considered the best. Old and worm-eaten grain, however, must not be given to them as they invariably suffer from consuming such.

A curious thing about pigeons is, they are very fond of strong smells, and on that account some ignorant people will not have their pigeon houses cleaned out, which is a great mistake; though for some time they may flourish, but disease soon makes its ravages when it once sets in. A good plan is to strew the floor of the house with old mortar and gravel in small pieces and to these add a little salt or saltpetre.

Pigeons should always have a supply of water to drink and to bathe in.



The above is an illustration of a dove-cote which is as good as any description for keeping a few pigeons, but a piece of wood cut into the shape of the front to close this box or dove-cote at night, is necessary as the owls in this country, in some places, give the pigeons great trouble and frighten them at night; and not unfrequently they prevent them from breeding and destroy the young and eggs. The interior of this cote is made of shelves and partitions, six or eight inches deep to keep each pair apart, and the entire box must be placed on a pole or on a loft, or in it, where rats and cats cannot get at the pigeons. Any loft may be converted into a pigeon house. A most useful contrivance is the bolting wire, which is constructed as per illustration.



Fixed to the slip of wood B, are two bent wire hinges or staples on which another slip of wood is suspended A. C. C. are two pieces of wire driven into A, reaching up to bar D, so that a pigeon on the outside can easily force his way in, though cannot push the trap outwards. In other words, once being in the cote cannot get out of it, till allowed to do so; so that any one having tumblers can let them out to have a flight for an hour or so, and call them in with a pigeon whistle or call which produces a sound long, shrill and loud, to which the birds will attend even when at a great height, if on their arrival they are fed regularly; this trap can be fixed to any pigeon house, but care must be taken that the birds are released at least twice a day to enjoy a flight.

MEAT PRODUCTION IN INDIA.

GENERAL REMARKS.

CHAPTER XV.

THERE can be no doubt that as good meat can be produced in India as in any country, and though the cattle are small, the texture of the meat is finer, and well and carefully fattened cattle always produce meat of the very best flavour; and though some run away with the idea that no meat can equal "the roast beef of old England," it may be said here that the idea is quite an erroneous one; chiefly because good meat can be got in England more readily than in this country and not because good meat is not to be obtained here, nor that it cannot be produced, because it can be and in fact, is produced; only a few of those who talk in such terms ever see really carefully fattened meat; while others rush to the conclusion that there cannot be such an article as good as English beef in India, because it is Indian, and everything that is so, must be inferior. Very little meat, proportionally speaking, that has been properly fattened reaches the market, and it is even then doubtful that such has been *perfectly produced* for *perfect meat*, be it from cattle bred from birth for the purpose, that is to say, such cattle, be they sheep, goats or bovines, should have been from the very beginning of their existence kept in such a state, as never to have become lean and never retarded during the steady pro-

cess of fattening. Such meat is almost, if not entirely, unknown to India ; yet some fairly good meat can be got in the markets of our large towns that will compare very favourably with English production. This in itself speaks volumes in favour of India. On the other hand, in less favoured situations, in the mofussil and in small stations, the butcher sends round his book to residents to state that he will kill a pampered bullock on such and such a date, and solicits the residents to sign for pieces of meat, which they are obliged to do, or go without, unless provided by rail from some large city.

It has barely yet arrived at that period in India when meat production will be perfect. A good many circumstances stand in the way of this even up to this time. First, the rearing of stock directly for this purpose, and secondly caste prejudices, because a *portion* of the inhabitants are such as hold cows to be sacred. On the other hand there are immense advantages in India for rearing cattle for meat production. There is unlimited pasturage, but it is not of the very best description, though it can be much improved, artificially, at a small expense. A certain degree of warmth is necessary to facilitate good fat meat with the least possible expenditure ; and such a climate can be found in many parts of so vast a country as India with so many different altitudes over its surface, at marketable distances from large towns, not to say that very good meat cannot be produced even in the very warmest portions of the Empire.

There is one point, that the professional butcher will

have to bear in mind, as also any private club or person fattening cattle, and that is, that all cattle that are the least cultivated or what may be more properly called, not artificially bred, when fattened gain their fat inwardly, not *in* and on their flesh but more inside of the body or carcase. This is well known in the old country, and the type of cattle called short horn and cross breeds from that type, are considered to be the best for meat production (not only on account of their size, as that too must not be lost sight of by any means), but because they fatten readily, and the meat has the best qualities, is of a marbled appearance, and even the lean has a roscate tint and is quite melting in substance, as good fat meat should be.

The best stock should be selected for these purposes, *vide* the very best authorities who are unanimous on the point that the best stock are of pure breed.

Cross-breeding has been introduced to improve breeds for certain purposes, among these purposes are meat production, but after the lapse of many generations the characteristic of the unimproved breed has shewn up. This is called "*atavism*," or in other words breeding back, and such should be expelled from the breeding stock.

. When cross-breeding is adopted, there should be no affinity of blood, which causes disappointment and engenders pernicious influences, debility and disease, and produces sterility in their breeding powers.

However, when writing so far in advance of the

times in India, when country breeds of cattle have not been fixed as true types of their kind, it seems almost superfluous to make these statements, but in the hopes of the future when breeding stock for certain purposes will become an art as well as in Britain where the names of such men as Bakewell, Booth, Bates, Ellman and Webb as breeders of stock will ever live in the memory of lovers of the bovine species, as perfected by man to his own satisfaction.

It is best, under present circumstances, to trust to the individual merits of such stock as we have for such purposes as slaughter, as few of us have the capabilities of the above mentioned renowned gentlemen, though for those who may in the near future adopt such a profession as the breeding of cattle, these notes may prove of value and will be hard and fast rules to go by.

When writing of meat, it must not be forgotten that sheep and goats are a variety of yielding stock not less important by any means than the bovines, and require attention in this part of the work under notice, and the above remarks apply to them as much as to cows. However, there is this important point in rearing cattle for show, as well as for slaughter, that under the present system of management the entire stock in India are deprived of their right nourishment to a very great extent, and by that is meant their mothers being milked, and the milk the young ones are deprived of is not replaced by any other food as is the case in England and the Continent.

There at least some provision is made for milk being

taken from the mothers, by some substituted substances being given to the calf, however poor a substitute it may be. Then there is the vast superiority of English cattle, and these again are kept up to the right standard by having thorough-bred bulls introduced into the stock, these bulls being reared from prize or show stock that are not milked, and by the careful prevention of *inbreeding*.

Sheep and goats always thrive best on naturally dry and unretentive soils: soils that do not retain water naturally; a sandy soil is desirable, where the pasture is short in growth and not long and rank. Calcareous soils, or soils with a good quantity of limestone are better than that of any other mineral origin.

Pigs being properly bred, under shelter on the farm, are of course directly under the eye of the farmer and the breeding of them requires no mention of details here, further than that good imported stock should be obtained for India, either Chinese or English and during the time they have litters they should be fed well, as good sorts of food cause a plentiful secretion of milk; care should also be taken that they do not overlie their young and smother them.

There are certain grains which are good for growing cattle, and those mentioned below are as good as any that can be had for calves that are just weaned—

Gram, peas or lentil meal	...	1 seer.
Crushed decorticated cotton seed	½	seer.
Common salt	...	1 chattaek.
Wheat bran	...	¼ seer.

This mixture made into two feeds, in a warm mash, at blood heat, should be given to the animals. All changes of food should be made gradually, for if this precaution is not followed, illness of various sorts sets in.

The great advantages of having cattle well and carefully treated from birth and onwards is no myth, and can easily be proved by a few examples which might be mentioned here, were it not that it would take up too much space in so small a work which must be concise to cover so many subjects as are treated of.

Good pasture should be carefully selected, and if possible, bone manure scattered on it to enrich the growth. The best authorities admit, though themselves Englishmen, that the north-east of Scotland including Forfar, Kincardine, Aberdeen, Banff and Moray produce the finest bred cattle for fattening in the United Kingdom because they are carefully given good food from their birth.

For fattening purposes the undermentioned mixtures are good ; mix in small quantities with the chaff given, to give it a relish.

Beans, peas or lentil meal.

Barley, maize or buckwheat meal.

Crushed linseed oil-cake and some molasses.

Three pounds of this mixture made up in equal parts with an ounce of salt and a quarter of an ounce of ginger, given with chaff, steamed, is equal to nearly two stones of turnips, which is among other roots the chief used in fattening cattle.

In any method of feeding, the food must be given, so that large quantities of it are not before the cattle at one time; thus—

Feed at 7 A.M.	...	Chaff and mixture above, a good basket full.
„ 10 „	...	Grain of gram or the mixture below $3\frac{1}{2}$ seers.
„ 2 P.M.	...	Chaff and mixture above as at 7 A.M.
„ 6 „	...	Grain $5\frac{1}{2}$ seers and as much chaff hay or half-dried grass as the animals can consume till they feed in the morning again.

The following mixture takes the place of gram if it is preferred, and is cheaper if the ingredients can be got in the locality:—

Very coarsely ground meal of gram	$2\frac{1}{2}$	maunds.
Ditto peas or lentils	...	$1\frac{1}{2}$ „
Oil cake	...	$1\frac{1}{2}$ „
Malt combing or brewery refuse	...	$1\frac{1}{2}$ „
Chaff of barley or wheat straw	2	„
Salt	...	$1\frac{1}{2}$ seers.

Add to this some hay or half-dried grass.

Two buckets full of water should be given to each of the cattle during the day.

Private cattle keepers who might not care to take the trouble to have the above made up, can feed their cattle on gram, and chaff of wheat or barley straw in the interval, as above stated.

From time to time careful note should be taken to see how the animals progress in condition, and if they do not do so, they should have a dose of medicine given to them ; such as Epsom salts noted in another portion of this work, or linseed oil may be given instead.

A very good grain for fattening cattle is decorticated cotton ; if the seed is not decorticated, it should be put in an iron vessel over a fire and roasted to burn off the cotton, and should then be cleaned, crushed and given, as when undecorticated it is dangerous food ; decorticated cotton seed is excellent, both for milk-giving properties and also for fattening. Decorticated cotton seed oil cake too is excellent.

Gaina cattle, or the miniature cattle of India, are easily fattened, and some mofussil stations have clubs for the purpose.

Sheep may be fattened on gram alone, or gram and oats mixed, but the former grain is most beneficial by itself for the purpose. The animals should be placed in pens or sheds surrounded with troughs just raised off the ground, in which as much gram should be placed at a time as they can consume, and this should be repeated four times a day ; water troughs should also be supplied, and these should be freshly filled twice a day, so as not to get at all tainted. These sheds should not be too large but so that they simply can get sufficient and no more exercise than is necessary for their health. The gram should be sprinkled with ground rock salt, or common salt, each time it is given to them.

Goats fatten very readily in the same way, but they should be taken out to graze for an hour or two each day, or green food should be given to them in small quantities, besides what gram, or gram and oats they can consume, or they are liable to suffer.

Pigs also are readily fattened, but this matter has been already dealt with under the heading "Pigs," so is not reverted to here, further than to say that oats are considered the best food for them, only they should have a change of food and mashes given to them. The Chinese variety is considered good in England and is undoubtedly so, though small, one advantage is that they can be got in Calcutta, or any of the seaport towns more readily and cheaper than English breeds. They must be protected from cold and rain, especially in the hills where the climate is cold.

Another point generally regarding all sort of cattle, be they sheep, pigs or goats, must be taken into consideration when purchasing for fattening,—that is, they must have reached maturity, and again not be too old

It has been remarked by good authorities that sex influences fattening; as almost always, other circumstances being equal, the females will attain maturity at an earlier age and fatten with greater rapidity than the male, though she will not attain that great weight of carcase.

As the reader is supposed to have perused the above subject, a few remarks may be made here before con-

cluding, that they may remain fresh in the memory, and that is, that as cattle are kept in stalls and sheep and goats in pens from which they are not allowed to move (except goats), the most scrupulous care must be taken to keep their stalls or pens clean, and that the food and water troughs should be kept free from all dirt, which in time would become nauseous to the animals and cause disease. Thus, if feeding and drinking troughs are not attended to, the process of fattening is retarded, or the germs of disease engendered, or an epidemic induced, which might easily have been avoided.

THE KEEPING AND TREATMENT OF BEES IN INDIA.

GENERAL REMARKS.

THE keeping of bees in India in a domesticated state if it can properly be so called, is
The old and new system of bee-keeping in India. no new thing, as natives and also a few Europeans have done so for ages past, but the entire system has become much modernised and improved and many artifices adopted, so that the yield is very greatly increased.

The ancient bee-keeper knew little if anything of what work and progress was going on in the hive, and not an uncommon occurrence was the suffocation of the inhabitants of the hive before anything was known of it; they swarmed also as they were guided by instinct, and starved and queenless they got along as best they could without the aid of man.

There is no doubt whatever that bees can be kept successfully in India, because there are indigenous bees that yield profitably when domesticated, and we have the high temperature that is essential to their development, as well as the sunshine which the matured bees revel in.

The Indian bee, "*Apis indica*," which is the variety that is indigenous to this country and which is worthy of cultivating in a domestic state, is to be found all over Bengal, as well as over a great portion of India, but this variety must not be confounded with "*Apis florea*," a small bee which builds a single comb, and is worthless for the purposes treated of. The English black bee, "*Apis mellifica*," has been introduced, and also the Italian bee, of these the latter is considered the most desirable by the best authority on the subject in India, namely, Mr. J. C. Douglas, of the Telegraph Department, who has imported and in several instances distributed the imported sorts.

Amongst later improvements for the keeping of bees may be mentioned, the bar-frame and the improved hive, which enables one to examine the combs at any time and to take stores from one hive to another, change the queen, to make artificial swarms as well as keep in control the breeding, and all without in any way injuring the bees.

Then there is the artificial comb foundation, which saves the bees a great deal of time in making it, from newly secreted wax, thus adding to the yield greatly, as also that it keeps down drone breeding.

The queen cages keep the queen from taking away the population with her; smokers nuclei, the system of artificial swarming and sectional spars, are all inventions that make bee-keeping much more certain, and the management a great deal easier; many of the accidents and ills are done away with, and the barbarous system of killing the bees for the honey is avoided, thus making bee-making infinitely more a remunerative employment.

The outlay on the same is small, though no one must think of bee-keeping without any capital at all. The yield is large after once starting, with a trifling working expense; "the capital may be rapidly increased as experience is gained, by the mere investment of the income, and the natural increase of well cared for bees; the return for the capital is as certain and relatively much greater than in any other rural industry."

The hill-men in Darjeeling, Bhutan, and elsewhere, keep indigenous bees; but the system is such a barbarous one as to be worse than the old Continental mode of bee-keeping, and cannot thuswise be paying to any extent, even if it is so at all.

But seeing that improved methods of keeping bees have only of late been made in Germany and America, while there are only some small apiaries in England which have adopted these methods, it is not to be wondered at that the same have not reached this country except just to be known to a few Europeans; and the honour of having first spread this system even to the extent it has only yet been introduced is due to Mr. Douglas.

In America the English bee was introduced, as there were no bees on that Continent; and in Australia both English and Italian bees have been introduced, and are yet being imported.

TO DISTINGUISH THE PROPER BEE OF THE INDIGENOUS VARIETY, &c.

CHAPTER XVI.

Apis Indica is probably the only Indian bee of the double comb building varieties that can ever be suitable for domestic keeping and be profitable. *Apis Indica* and *Apis florea* only are of the *Apis* genus; and those building single combs are not so, but may easily be confounded and mistaken for them by the novice or amateur who may have lately turned his hand to bee-keeping, and more so, because there are other varieties of the same *Apis Indica* differing more or less in both size and depth of colour, some being small and some larger, among which latter is the Bhutan variety, which are generally milder in temper than the others. These Bhutan *Apis* build worker cells $5\frac{1}{2}$ to the inch while other varieties have worker cells 6 to the inch. *Apis Indica* varies from $\frac{3}{8}$ of an inch to $\frac{1}{2}$ an inch long, and has dark and yellow stripes on its abdomen alternately. There is a large bee about $\frac{5}{8}$ of an inch long which builds 'under boughs of trees and hanging on projecting rocks, making a single comb; also another bee of slender form $\frac{1}{8}$ of an inch long, which has an orange coloured band over the lower portion of its body,

What bees are useful being *Apis* and those that are not so.

How to distinguish the different sorts.

followed by alternate black and white bands. These are not suitable for domestic purposes, though the honey is very good, because being one-combed the brood and honey must be taken together. These do not belong to the *Apis* genus; there are several smaller varieties that make irregularly formed nests in hollows of trees and in the ground, but are so small as not to be easily mistaken for *Apis Indica*.

Apis Indica makes its combs in the hollows of trees or under caves of houses, and these cakes of combs hang vertically and parallel to one another, the cells of workers being $5\frac{1}{2}$ to the inch in the Bhutan variety, and 6 in those made by the plains variety. The Indian bee is no more difficult to handle than the English or black bee, and can be advantageously cultivated in the same way in frame hives; they can be got from natives, or may be procured by tracing them to the jungles. A small quantity of honey, a piece of honey-comb suspended, or syrup put in a saucer in a sunny place, near or in a verandah, soon attracts them, and they may be traced by following the direction of their flight. This, however, can only be done in the hills in the warmer months, though in the plains, even in the cold weather, on sunny days the bees go out to gather honey.

A swarm may be captured in the hot weather and before the rains set in, or being
How to procure bees of the *Apis Indica* varieties. traced, they may* be captured thus: if in the hollow of a tree or log of wood, make holes in the log if it is necessary, that the new bee-hive placed now near it and about the time it is dark,

so that next day when the bees are at work they may pass through the holes and through the new hive you have placed there to get them accustomed with its appearance. The new hive must be left there for a couple of weeks, then drive the bees (as will be explained further on), or clustering bees may be swept into the new hive, and then taken to its stand in the new position it has to occupy, if that be close at hand. But as soon as they cluster they begin to build, and should the place be some distance away from the place of capture, it is best to leave the hive where it is, propped up till sunset on its new stand, which should be there and then removed with the bee-hive to the place where they are to remain. They should be supplied with old comb foundations or guides and fed. They must, however, be as little disturbed as can be or they will abscond.

A stock either purchased or captured may be transferred in a fortnight to a frame hive : that is, they may be taken from one hive and put into another, comb and all. If the stock be taken from a hive without a frame, the combs must be cut out and fixed in the new hive with the frames, into these. Have the frames ready, with fixers, which are the best thing, or tape and strips of bamboo, or melted wax so as to fix the combs quickly while transferring. With the aid of smoke, drive as many of the bees off one comb on to another, cut that comb out and fix it in a frame. Should there be any bees on it, sweep them off with a wet feather or bird's wing or cloth, and so go on repeating the operation till the last comb is arrived at, when shake the clustered bees

into the new hive. Seeing the queen is there first, try and shake her in at as early a stage as can be, though this is not easy, as she goes from one comb to another, several bees following her, and, if it can be done, a comb with her and her escorts on it can be cut and transferred and the work continued. All this should be done as quickly as possible. If combs from another hive are already fixed in the new hive to receive the bees, this work can rapidly be accomplished.

If the hive to be taken is in a hollow log, the bees must be driven with a few puffs of smoke from their combs. They should then have some syrup sprinkled over them with a spray producer or otherwise (say two wine glasses full or two chattacks). In this state they can do little harm and are easier managed, then cutting the comb quickly, fix the same in the frames, which latter can be fixed in the hive with small nails or tacks, and the box temporarily closed by nailing down a thin board over the body. It must be remembered that bees can be driven upwards, not downwards. Probably the best way is to sweep the bees, or drive them into an earthen vessel or a packing case, and then cut out the combs, fixing the same into the frames, and proceeding as above, shaking the bees into the new hive after the combs are fixed in the frames in it.

Care must be taken to see that queen is among the captured lot, or it is very unlikely they will remain, unless there are brood combs which may induce them to remain, and this is a strong inducement in place of the

Inducements to bees to remain.

queen's presence, and in which case they may breed a queen, or a queen may be procured for them.

The brood-combs should be in the centre of the food
 Position the combs should be in. or honey-combs in arranging the combs in the frame in the hive.

It is necessary to have a knowledge of the difference between the queen, drone, and worker bees, as without this the new aspirant to bee-keeping will not be able to succeed, for there may be a hive full of a great many drones, or on the other hand workers and no drones, or there may be no queen to continue breeding.

The worker of the *Apis Indica* has a more pointed
 The worker bee described and also the drone. posterior than the drone, which possesses a bluntish hind quarter.

The head of the drone is rounder; that of the worker flatter, the eyes of the drone are large, that of the worker, smaller. The worker has alternated yellow and black stripes over the abdomen, and has a long tongue and strong jaws. Bees have simple and compound eyes in the centre of the head, and the compound or large ones at the sides, and these latter in the worker are further apart and the simple eyes more on the centre and top of the head, while the compound eyes in the drone meet on the top of the head and throw the simple eyes lower down on the face. It will be seen also that the workers have the pollen baskets or propolis beams on the hindermost legs, which are composed of nine rows of bristles. The drone is longer than the worker and thicker set, and has not the yellow wings of the worker class; the blunt posterior is very

hairy, and is altogether darker than the worker. Drones have no stings, they do not work, and the sound they make when flying is different and their flight is erratic.

Bees vary in appearance with their age; when just hatched they are of a lighter colour, having a powdered appearance, and are hairy; old bees lose their hair by degrees till they have none left on the abdomen, below. Appearance of old and young bees. Young bees do not sting so readily as old ones when handled, they cannot fly at first, and only slowly gain the activity characteristic especially of the Indian bee. They readily receive a queen which old bees will not, as they sometimes destroy the queen and enter into a conflict of extermination with the workers which may have been introduced from a strange hive.

The queen, or mother bee, is the only one perfect female in the hive, because she The Indian Queen bee only can lay all the different sorts or sexes of bees' eggs; that is to say eggs that produce queen, drones, or workers. It will be readily seen therefore that the existence of the stock depends on her. The colour of the queen is like that of the workers, but the dark stripes are darker and the yellow less distinct. She is larger than a worker, and with a longer body, which latter is very markedly longer, and her wings are short; and though she has the thick hind legs of the worker she has not the pollen basket. The queen, too, differs under certain circumstances: her abdomen is much

longer in the breeding season than out of it, and at such times, especially if she be a small queen, she can only be distinguished with difficulty, though even then she is longer than the workers; and her small wings mark her as the queen. This relates to the Indian variety only, but the Italian queen bees are markedly long and

The Italian Queen bee, very easily recognised, which is a great advantage over the former; this variety of queen is much like the workers. All queens have curved stings which they only use to fight with other queens. The numbers of young bees proportionally in a hive, are known by the brood in it.

In winter numbers of bees die off, and an authority on the subject says a stock of 60,000 is what may be called strong; and 15,000 to 40,000 a common estimate of a full hive: but the former would be considered a medium stock, while the latter is strong, in fact any number over 15,000, which is considered a medium swarm, is strong.

There are very few, if any drones in the stock, during the rains and winter in the plains and hills respectively, and it may be considered that the rains in the plains is the equivalent of the winter or non-working time in the hills: but in the plains on sunny days the bees *do* go out occasionally to feed, when it is warm and clear; the approach of swarming time is when drones are bred, but when the honey harvest comes to an end, they are worried by the workers, pulled about and killed or driven away (not stung to death as

Estimates of what are strong and weak swarms.

What becomes of the drones at the end of the honey harvest.

is sometimes said). During the working season, about one-third of the bees leave the hive at any time when it is sunny and fine

The bee has a short life, and it is said that workers only live six to eight weeks when they are working hard during the honey harvest season, and only those hatched in the autumn live till the next season through the winter, and the same is the case in the plains that those hatched out just before the rains are out only live till after the rains are over a sufficient time to make a young brood to perpetuate their kind.

Drones only perform their sexual intercourse and then die (as regards the individual drone), and those that are bred in the spring or early summer, are destroyed by the workers during the autumn of the year, probably to economise the winter store for the workers and queen; but in a queenless hive drones are tolerated; though if not required, they are generally killed.

If honey fails, the workers drive the drones out or worry them to death, that is, when there is a bad honey season on account of bad weather, but if the hive is queenless, they are sometimes allowed to remain, and it is only by watching the treatment of the drones that the condition of the honey store can be judged of.

Queens live several years, unless they meet with illness or accident, and they have been known to be productive for five years, but are at their best at two years.

The length of life of bees
in workers Queens and
drones,

Drone's life.

Queen's life.

PROPOLIS, POLLEN AND WAX.

CHAPTER XVII.

PROPOLIS is a substance gathered by the bees and which they use for cementing their combs to their attachments, they also employ it for filling up fissures and cracks in their hives and also to varnish the cells; it is a dark resinous matter collected from buds and barks of trees.

Propolis and its uses, and what it is made from,

Wax is a substance which is secreted by the workers, from glands under the abdomen and between the rings. Four of these glands are on each side, making what are called wax-pockets; this substance is exuded at the correct time, when it is required, and just enough of the comb is built at one time for the needs of the swarm, and is added to, as necessary; the combs are not built of equal sizes and shapes, but in accordance to the hollow or cavity they build in, combs are ordinarily built of a

Wax and where it is formed and secreted

Form of combs when the bees have space.

somewhat triangular form; the narrow end of the triangle pointing downwards though much rounded in form, it will be seen by this form being adopted that bees will not fill the form of an artificial hive so readily, and thus the hive would not be readily kept at a high temperature, which

is necessary for the brood to hatch ; but the bee-keeper puts in a great deal more comb than the bees would naturally have, and thus fills up the space, or other artificial means are adopted, such as putting in a dummy to contract the space if there are too few bees. By putting in ready-made combs or foundations, it saves the bees making them, and much more honey is procured because they have more time to gather it and greater space to fill.

The large rectangular frames sometimes used make it more difficult for the bees to get from one comb to another, and to do away with this difficulty, holes are cut in the combs, and passages are made over them for the winter purposes.

New combs are very delicate and fragile, and being tender are easily broken. Older combs are harder, according to age ; new combs are easily distinguished as they are of a light colour and till used, remain so ; the bees put a sort of varnish over them, and the silken cocoons of the brood which are left in the cells give it a darker appearance, and by slow degrees these cells get so contracted that the bees reared in them are stunted in size, which evil is avoided by the bee-keeper having a stock of foundations and combs in hand to renew them.

It must not be supposed that because the comb may be dark the honey will be so, because it is just the same in all the

Difficulty of the bees to get about over the rectangular frames

New combs and old combs.

Honey in dark old combs.

combs, and does not differ in colour. Old comb is more convenient to handle, and it is warmer for the brood and for the bees to winter in.

A comb from an ordinary hive weighs about 2 lbs. Weight of comb and honey. and when full of honey, it represents 10 per cent. of the weight of the honey.

When a swarm leaves its hive, the bees fill themselves with honey, this is to produce new wax, and it is said that Quantity of honey required to make wax. *bees consume 16 to 20 lbs. of honey to produce a pound of wax*; thus it will be evident what an immense saving the bee-keeper makes of honey, by supplying comb; he therefore empties the combs and gives them back to the bees, so that they may begin making honey at once.

The comb has three kinds of cells; worker cells, Different sorts of cells which make the comb. which only differ from drone cells because they are smaller, and the queens' cells, which are void in form and are generally built at the edges of the comb, sometimes on the surface and projecting from it. The following are the measurements of cells :—

Worker cells 6 to a linear inch and $5\frac{1}{2}$ of the Bhutan variety; the English black bees Size of cells of workers and drones. worker cells are 5 to the linear inch; drone cells of *Apis Indica* are 5 to the linear inch, and the drone cells of the English bee are 4 to an inch; drone cells of the Bhutan variety are 5 to an inch, as is also that of the Italian bee.

The worker cells are first made, then when the season requires it drone comb, that is, when there is honey in plenty and it is being gathered in fast.

When worker combs and drone combs are made.

The bee-keeper requiring drones for breeding, inserts drone comb into the hive, and by artificial stimulating food gains his end.

The queens' cells are quite different from the others ; they are made of a cup shape, hanging downwards, are elongated, covered with an excess of wax, and corrugated with minute cells like the depression in a thimble. A day or two before the queen is hatched, the bees thin the wax at the end of the cell and leave the cell thin with a flat end. The queen being ready to come out, the cell is opened below by a circular lid which hangs down as the queen emerges ; the bees then cut down or remove the cell altogether ; and those on the surface of the comb are generally removed.

Queens' cells : how and where made.

In a natural state the combs of *Apis Indica* are $\frac{1}{8}$ to $\frac{3}{4}$ inches apart from each other. The worker brood comb is $\frac{1}{4}$ inch thick and drone brood comb 1 inch ; store combs are $1\frac{1}{8}$ to $1\frac{1}{2}$ inches thick.

Distances between combs and thickness of combs.

Cells are used for various purposes, for honey, pollen, and brood till the small larvæ or maggot-like young bees turn strong enough to gnaw their way through, and then

The uses of cells.

when the tired bees come home, they may be seen resting in these cells for 15 or 20 minutes, quite still, as if to revive themselves; even in cells containing eggs, as also in empty cells they seem to rest. The comb containing honey is about one-third of its depth on the top, and the brood below it. When drones are not being bred, drone cells are commonly used for storing honey, especially if they be on the top and back of the hive, or if drone comb has been inserted there.

When breeding is continued it extends upwards till the comb is covered, and perhaps every comb may be filled with brood, but if honey is coming in fast, all the vacant cells are filled with it as soon as empty and even the cells necessary for brood, and breeding is prevented. This is sometimes the case through mismanagement in feeding.

“When the combs run across the entrance, the back and front combs are used for brood last, and these are filled with honey from top to bottom until required for brood, and they are also so used when the brood nest is contracted.” At the beginning of the breeding season, the honey from the back of the hive is brought into the brood nest; and this may be hastened by the keeper cutting the caps off the honey cells which hastens consumption and stimulates breeding.

Fertile queens lay their eggs regularly and in a patch on one comb and then on to other combs and so on upwards. Drones are sometimes bred in worker cells, and workers in

How queens that are fertile deposit their eggs.

drone cells, though this is not commonly the case but the exception. The outside faces of combs are seldom used for brood; those generally used for that purpose being those in the centre and near the front but facing inwards. Sometimes several eggs are laid in each cell, that happens when there are too few bees to cover the number of eggs the queen lays; and she may stop laying, the bees may destroy all the eggs, and the stock get extinct or the bees may abscond. Occasionally the bees mend matters themselves and get one egg into each cell. The remedy is by giving young bees from another stock, or by giving a comb of capped brood, or by slowly feeding them with meal and honey and reducing the size of the hive to two combs; in this way heat and labour are economised, and the bees kept from absconding. Great care must be taken in these cases not to disturb the bees more than is absolutely necessary, and smoke must not be employed.

When a hive is queenless or cannot breed, a worker bee may assume such functions, but as she cannot be impregnated, all her progeny are drones, the eggs being scattered all over the comb in worker bee cells and not in the centre of the comb in a mass as that of a fertile queen, and thus the population of the hive would soon become extinct. Also drone bees may be hatched in worker cells, if only worker cells are given to the bees, but in such case the drones are small.

Even worker bees become queens.

How hives get extinct.

The pollen is not all placed together, but distributed
Pollen, where it is placed, over the brood cells and near to
 them in the comb.

Young bees become nurses and attend to the brood
The employment of young bees, inside the hive, which is an eco-
 nomy of labour, as they cannot fly
 till from five to ten days old ; bees keep their hive clean
 and remove dead bees, or slugs which may have been
 stung to death, wasps, pieces of wax, or other substances
Bees keep their hives clean, which they can convey away be-
 yond the flight board, and if they
 cannot remove it, it is covered with wax. They do not
 void fœcal matter in their hives unless shut up in them,
 as when carried on a long journey or when there is dis-
 ease among them.

This is the cause of disease in importation, as also
Cause of disease, feeding with thin liquid food when
 they cannot go out in the rains,
 or cold weather.

It is an instinct of the bee to regulate the temperature
Bees regulate the tempera-
 ture of the hive and cause
 ventilation, of the hive, for on hot days they
 may be seen fanning with their
 wings at the entrance of the hive,
 while others are fanning inside so as to keep up a
 circulation of air ; this is important and will appear
 obvious when it is considered how numerous are the
 inhabitants of the hive, yet a certain degree of heat is
 necessary to hatch out the eggs ; and it seems the bees
 regulate the temperature by stopping up all cracks and

holes with propolis to keep damp and draughts and regulate the temperature themselves.

The best time for removing bees is when it is dark, because at that time they have all returned and are up in the combs all together: during the daylight especially on clear sunny days they start work as soon as the sun shines and do not return till it is almost dark.

During this time they are said to travel over a radius of not more than two miles from their hive, so if a hive be moved a mile and a half, very few bees are lost; but if the hive is removed only a short distance, many return to the same place where the hive previously stood and are lost, so that when removing hives only a short distance, some precautions must be used.

The pollen used by bees as bee food for the brood, is collected and stored in the cells for future use mixed with honey, the former supplying the nitrogen which is not in the latter.

At low temperatures the wax is hard and brittle, but when it is hot it is pliable; thus the bees can only work at it when it is warm. The bees keep the brood warm by clustering over it and not over any other portion of the comb which they leave uncovered. When there is more comb than the bees can cover, during the inactive season, it should be removed, fumigated and put by as

the wax moth is sure to attack it. The hive also should be contracted as much as possible to economise heat.

The fumigation of the combs is generally done with sulphur; during the rains the wax moth invariably attacks comb that is uncovered by bees, especially those of the *A. Indica*, but the Italian species protect their combs. In winter it is important that the top of the hive be closed to keep in the heat which would otherwise rise and escape; the temperature of a hive should not be over 98°, or in winter below 50°.

The heat in summer causes the moisture to condense, and this moisture, in the form of water runs down the sides of the inside of the hive, so that the use of chaff cushions, straw or such material to cover the hives is, if not absolutely necessary, conducive of much good, because they are non-conductors of heat.

Bees are placed to guard the hive at its entrance, and they examine all bees that go in; and a tap on the flight board will soon bring them out ready for attack. They kill any bee from another hive seeking entrance, unless laden with honey.

Bees readily sacrifice themselves in the protection of their hives and attack hornets, wasps, and bees from other hives, but will not, as is supposed, attack *en masse* if properly handled.

Indian bees are more active than the British black
 bee in their attack; and the
How different varieties of bees attack. Italian variety not uncommonly
 gives an angry buzz or note of warning which if paid
 attention to, and the intruder retires, he will probably
 not be attacked. Some short distance from a hive,
 bees will not sting unless seized or crushed.

Bees, it is said, do not sting a queen, and apparently
 they do not, but they ball her
Bees killing a queen how they do it. and so suffocate her; drones also
 are not stung, but worried and driven out.

The Indian bee is inferior to the English bee in keeping
 intruders from their hive, although they are more
 active; but Italian bees are most vigilant in their guard
 and even keep out the wax moth which gets into the
 hives of the British bee.

However vigilant bees may be in thus guarding their
 own hives, they attack and rob
Bees robbing other bee hives queenless and weak hives when
 honey fails. Fights may be seen between individual
 bees: they become demoralised and rob, and this is
 the indication of it.

A general war may break out, and the apiary become
 extinct. The bee-keeper then
War among the bees must intervene by narrowing the
 entrance to the hive, so that only one bee can pass
 at a time, so that the entrance is better guarded. This
 entrance must be carefully kept clean and clear of

dead bees and other matter, and a feeder or ventilator is applied to prevent the stock from being suffocated.

Should reducing the entrance not succeed, the hive should be closed till sunset.

The bee-keeper then unites weak stocks, and nuclei require special care, that they be not attacked by strong stocks.

When honey fails, the bees not only kill the drones, but also drone brood and worker brood.

If very young bees' *larvæ* are allowed to come out of the hive, this is a certain sign they are short of food and it must be supplied to them.

Certain signs of want of food.

The queen is the last to die of starvation, because if confined with a few workers they give their honey to her in their honey stomachs, and then die of starvation themselves.

Thus through a winter when bees are starved, the queen is the last to die of starvation, although most of the bees have died.

When too much honey is taken away from a hive at once, bees may sometimes start robbing and attack other stocks.

Bees have a habit of clustering, hanging down in a mass by the hooks on their feet: thus too they cluster when frightened, leaving their combs. This is what aids the bee-keeper in his manipulation of them. A little smoke being blown on them, they at once fill themselves and are smeared with honey, then they cluster. This is why swarms are easily handled because they have fed well first before taking flight. Jarring their combs or hammering with a stick or hand on a box, log or hive causes them to cluster, but if they are driven through a whole or gap at the top of the box or log, they may just cluster on top of it, or on its roof and advance no further.

The conditions under which bees abscond are these:

When bees abscond, what the causes generally are.

1. Queenlessness. 2. An accident to her when they cannot breed another.
3. Too few bees to cover the eggs the queen lays or to cover the larvæ.
4. Failure of honey.
5. The hive being too hot, especially when bees are shut up upon a journey.
6. Ants or other insects annoying them.
7. Rough handling of combs in transferring them.

This latter in getting wild bees is not uncommon, and if it can be done, the old hive may be put into the new one and allowed to remain so for a fortnight or so. Caging the queen keeps them from absconding, but that even is not always successful.

When deprived of the queen, there is no doubt great excitement for some days among the population of the hive after which they may settle down and begin work

again, but not so vigorously nor do they defend themselves so vigorously.

Hives once used should be cleaned before being used again.

Hives once used should be thoroughly cleaned before being used again.

Bees can undoubtedly be called back. If a puff or two of smoke is blown over them in their hive on a sunny day, while Bees called back, and how to do so. probably one-third of the stock is out, it is clear that the bees in the fields and the gardens are immediately communicated with: because very shortly they may be seen returning in numbers and collecting on the flight-board; thus the bee keeper, knowing this, when he wants to call them in, does so with the object probably of getting them all in for his own purposes, to secure the whole lot for transfer or otherwise.

When bees are numerous in a hive, there is a great economy of heat during winter, and comparatively much less food is consumed, just as on the other hand, when there are few bees there is a larger relative consumption. In winter, bees are not strong and are sometimes induced out by a sunny day, when they fall in their flight and die: to avoid this, the entrance to the hive is shaded, so that the bees not seeing the sun do not attempt to go out.

Numbers of bees die in winter and the hive is much weaker, but as spring sets in the remaining lot resume work, the queen commences laying through the hive

and the population rapidly increases. Swarming then takes place, but not until the hive is full of honey and drone comb is built.

Some queen cells are built, and when these are capped, the old queen departs with a large number of bees, to make a new family or community, having first filled themselves with honey.

Swarming, when and how it takes place and how wax is made

The honey they carry away not only feeds them but helps them to secrete wax for the new combs.

In the old hive the young queen is impregnated and then begins to populate the hive; she then in her turn leaves with a swarm called a "cast," when a second young queen comes to maturity. The queens in the hive at the time of swarming may be numerous, say from four to thirty, but the queen in power destroys those not hatched out, and when the swarming disturbance is over, and if there be more than one queen, they fight until one remains in possession. In

The slaughter of the drones.

the autumn the workers kill the drones, filling their hive with honey, and through winter they rest from their labour: this is in the hills: in the plains, however, the rainy season takes the place of winter, when the bees come out on fine days, owing to the high temperature.

It is at this time that the wax moth must be prevented from doing mischief by contracting the hive and removing all combs which are not necessary, leaving only such combs that the bees can cover and that have food in them equal to their requirements.

SWARMING, BREEDING, ENEMIES, DISEASES, &c.

CHAPTER XVIII.

THE swarm will not leave till some queen cells have been capped over: the old queen then departs with a strong colony of bees, as previously stated, leaving the young queen or queens in possession of the old hive with some of the stock. The space inside the hive being small, swarming is induced: so, on the other hand, by enlarging the space it is delayed or prevented. Thus the size of the swarm is greatly dependent on the size of the hive.

Hence as may be seen swarms of wild bees in a wild state are, as a rule, small in this country; as they occupy small hollows equal only to a short residence and not allowing their population to increase to any great extent.

Wild bees are swarming varieties.

A. Indica are a swarming variety, and are therefore less valuable: all bees however in a state of nature are swarming bees: when once domesticated by man they lose their habits of nature, so far as it is prejudicial to the purposes of man, after repeated generations. Several queens are hatched out, and thus several casts, as they are called, are divided off, when the

remaining stock may become so divided and weak that at the close of winter they cease to exist.

When the weather is unfavourable, and suddenly becomes too cold or wet, swarming Swarming, when it takes place. may be deferred, the queens' cells destroyed and new cells again made, and swarming may take place further on or be deferred for the season. If swarming does occur it is when there are young queens: and then it takes place in the morning in fine weather when the young queens are left behind, and the old fertile queen leads it, *in the case of the first swarm*. They settle on trees, under eaves of houses, or in bushes, not far from the hive.

Where many bees are kept, several swarms will perhaps start at once and collect in one cluster.

If the first young queen in the hive destroys the When swarming is stopped, and how the queen does it. other queens that may have hatched out at the same time as herself, and also the remaining queen cells, then swarming is stopped; but if the bees prevent this, other casts go out: in such case, the queen utters a shrill sound which is recognised by the bee-keeper. The next swarm goes out in this case nine days afterwards, and more after it at short intervals, *and that at any time of the day*, and less carefully with regard to weather: also they may have more than one virgin queen with them: these lots often go long distances from their hives, and the queens fight until one remains.

These are unprolific swarms of which as many as four may take place, and so weaken the old stock as to make it almost useless.

A first swarm is valuable if it is early and so may a second one be *if early*, but as a rule it is prevented.

The young queen by some chance may not now be able to be impregnated by a drone, she then can only lay drone eggs, and no worker-bees eggs; she is therefore useless to the bee-keeper and the stock will soon become extinct

Queens not impregnated
can only lay drone eggs.

The young queen generally makes a trip to meet the drones at a warm time of the day, three days after coming out of her cell, and if she has been successfully impregnated, the same may be known by the parts of the drone being attached to her. Should she not be impregnated, she goes out again and again, if after one month however she is not impregnated, she may then be considered as useless and a drone breeder.

She takes a trip to meet
the drones.

If impregnation has taken place, the queen will begin laying three days afterwards.

How to know she has
been impregnated.

N. B.—Virgin queens cannot be kept over the winter and be impregnated in the spring.

A fertile queen is impregnated once in her life-time, after which she never goes out again except with a first swarm, and

Impregnation of queen
once in her life-time.

she lays both worker and drone eggs, *while the unimpregnated queen only lays drone eggs.*

The first year the impregnated queen may lay only worker eggs, or she may lay some drone eggs at the swarming season, but she goes on laying till eventually she may lay only drone eggs: thus it is necessary to have some surplus queens to replace old queens before they show signs of deterioration. The bees themselves replace queens that fail in laying powers, and the use of new queens keeps down drone breeding. The third year bee-keepers generally replace the queen unless she have some very desirable quality, and in such case she is kept for breeding stock or sale.

Eggs of all three bees, drones, workers and queens	appear alike and are less than
Eggs of bees.	$\frac{1}{16}$ of an inch long.

These eggs are attached to the bottom of the cells and have no limbs, but appear like white curved maggots at the bottom of the cells where they are fed by the workers with a whiteish fluid and about the tenth day get straight and fill the cells or nearly so. Then they are capped over by the workers, if it be a worker cell the cap will be flat, but if that of a drone almost hemispherical. These caps are made with pollen mixed with wax.

The larvæ spin very fine cocoons and change into the pupæ and perfect bee state. The bee then bites its way through leaving behind its cocoon.

It is said a queen will lay 2,000 to 3,000 eggs in a day, and the time they take to hatch is, workers twenty to twenty-one days, and drones twenty-four to twenty-five days.

The number of eggs a queen will lay.

The egg from which the queen is produced, is capped or rather sealed nine days after the egg is laid, and the sixteenth day after it is laid the queen comes out of it.

When there is no queen then the bees raise one from workers' eggs, if not more than three days old. In this case the queen is hatched out in ten days.

The loss of a queen and how she is replaced.

When the workers begin to gnaw the cap or top of the queens' cell, it may be relied on she will soon appear, probably, in one or two days. Sixteen to seventeen days is what is calculated upon; should the queen not then be seen, there will be a failure of a serious order, which must be remedied as soon as possible, or the population of the hive will become extinct.

If the bee-keeper does not supply drone combs there may be some drone brood brought up in the workers' cells. This often happens by giving worker combs purposely to keep down drone brood, and in such cases the drones are smaller.

Young bees' make short flights at first, and then evidently survey the country around going very short distances to begin with.

Young bees make short flights.

A bee dress is necessary especially to those who are timid when attempting to secure a swarm. The neck and sleeves should be tight at the wrists and thick woollen gloves should be worn, also a veil. Bees dislike the presence of some people, why it should be so, is not known; but others again can handle them with impunity. It is believed they dislike offensive smells; but a caste of natives who deal in the wild honey they gather, occasionally protect themselves from bee stings, by smearing their bodies with mustard oil in which some leaves of *Tulsi* (or *Quinn Sanctum*) has been pounded to give it the peculiar strong smell of that plant. A gentleman named Wildman could make a swarm of bees hang from his chin like a beard, or from his hand. Even the illness of a former master has been known to destroy their allegiance to him, and they would not suffer him to handle them till he was quite recovered. The veil for the bee dress is worn over a broad-brimmed hat and tied down round the neck of the coat so as not to have any aperture to admit the bees. Woollen gloves not only save the hands, but allow the bee to withdraw its sting. Thus attired, there is no danger, especially if some sweet oil and *tulsi* pounded in it be rubbed over any part that may be most exposed.

In removing their sting the bees not unfrequently leave their poison bag behind with the sting, and care should be taken not to burst it in trying to remove it, or when the bee stings by rubbing the spot. A small

bottle of strongest hartshorn is the best remedy, and no bee-keeper should be without it, so that if stung, he may apply it to the injured spot rubbing it in well.

After the queens' fight and one has stung the other, the wounded queen is permitted to crawl about for some time before she dies, but a drone that happens to be stung dies at once. The queens seem to have stronger constitutions than the other bees. The sting of the queen unlike that of the other bees is curved and is only used in Royal warfare (that is, when fighting with other queens.)

The Waxmoth is in all probability the greatest enemy of the bee-hive. It may be seen by holding up the comb to a good light, when it will appear like a thin web in it and gunpowder-like grains are scattered about. It devours the combs not covered by bees during the rains in the plains, and in the hills during winter. All combs taken away from bees should be stored away in a closed box especially at these times.

The Italian bees do not suffer from the waxmoth; the British black bee is less vigilant: but the Indian bee is still less so, and often its hive is shared by spiders and other insects. All likely holes and crevices should be filled up with putty, also saw-cuts, dirty quilts with wax propolis and honey should be avoided; and all rejected combs melted down at once.

Hornets prey on bees and carry them off, and wasps steal their honey when they can,

The bees' enemies.

that is, when the entrance to the hive is too large. In this country the Indian bee is so much smaller than the English bee, that the entrance to the hive should be made smaller, and when it is large enough for the bee it is too small to admit the wasps and hornets.

Birds of some species prey on bees, the flight-boards therefore should not be made

Birds.

large enough for them to rest on, and a small meshed net may be thrown over the entrance to the hive, large enough in mesh to admit of bees getting through, but not wasps, hornets and birds.

All hornet's and wasp's nests in the vicinity should

Hornets, wasps and hawk moths.

be destroyed by syringing turpentine, kerosine or boiling water over them.

Mice are kept out, if the entrance to the hive is kept properly small enough.

Mice.

They only invade hives in the winter when the bees are unfit to attack them.

Ants are very troublesome but can be avoided by having an earthen or other vessel

Ants and the bee louse

filled with water round the stand in the form of a ring. The small ants eat only the honey, but the big black ants and big red tree ants kill the bees, and having an armour on them that

bees cannot sting through, do so with impunity. The posts may be surrounded with a dish of zinc or earthenware filled with water, which is the best remedy. Each stand for a bee-hive should have a dish like this round it where ants are troublesome.

The bee louse may sometimes be found on bees, (especially imported bees) but is easily removed by tobacco smoke. Frame hives are a great advantage, as the contents of a hive can easily be examined for cockroaches, earwigs and other vermin.

Dysentery and foul brood are caused by giving *watery* syrup, especially during winter or the rains ; also by unsealed stores, being a matter of management only, the remedy lies in leaving sufficient honey in their hives at the close of the season ; drawing off all unsealed honey and feeding with sealed honey, or candy, and leaving the hive well ventilated but warm.

All infected combs should be destroyed and the others sprayed with a solution of salicylic acid. Clean hives and combs should be given to the bees which should be fed with thick syrup or honey. The stands should also be disinfected and all wood work.

The loss of the queen is a serious matter and another queen must be given to the bees. To avoid loss from starvation bees should be fed, especially in the hills, well in advance of the inactive season, so that they may have good time to seal their stores. Feeding in winter should be with candy (*i.e.*) solid food.

STANDS, HIVES, FRAMES, &c.

CHAPTER XIX.

Stands are best made of a single stout post firmly
fixed in the soil : a circular zinc
stands of hives or earthen vessel is then placed so
as to surround it with water just above the ground.
On the top of the post at its sides are nailed two cross
pieces of wood, which project beyond the hive, and on
these horizontal boards with spaces for battens for floor
boards. A piece of good strong twine is used for tying
on the hive to the projecting battens which pass over
the hive to the battens.

When it is intended that there should be more hives
than one, they should not be nearer each other than
three feet. The placing of the stands will be best
attended to in the view of future purposes.

Several hives close to one another should not face
exactly the same way : although
Several hives, the best aspect is facing the south-
east, or south ; and when one above another in tiers,
as in Europe, they should have vertical boards between
them, their entrances should not be directly one above
the other, and the fronts should be painted of differ-
ent colors.

All hives should be sheltered from the evening sun ; and as much as possible from wind.

Position of hives, As bees fly low when laden,
the hives should be near the
ground, but not on it.

The ground round about should be cleared of all weeds and grass, and be covered with broken brick, (soorkhe) broken stone, or cinders covered with ashes, so that bees may be seen on the light ground. Bees dislike damp, and the hives should be so placed as to avoid damp places on the ground where they are situated.

Hives are of several varieties but those strictly suitable to the climate must be used in this country. Then comes the question what sort of hives are most suitable? First of all considering they have to be so constructed as to be handled with the greatest facility and also so made as to see the bees without disturbing them, or disturbing them as little as possible, it must be judged what is best. It must be considered that there are a great many more insects in this country than in England, also that the heat is so much greater, especially in the plains. A hive must be made of some substance that will not harbour insects, as the straw hive does, and yet be a good non-conductor of heat. The straw hives too do not last in the heavy rains experienced in India. Metal of any sort is the worst thing that can be used, as in the hot weather it

The different sorts of hives
and those suited to the
climate.

is excessively warm and in the cold season the reverse. Woods are of various sorts, both hard and soft, the latter being the best non-conductors of heat in accordance to their softness: but such are soon destroyed by insects as a rule (barring perhaps toon), however, this can be obviated by steeping the planks in a strong solution of blue vitriol for some days, the longer the better.

Where there are white ants, stand posts should also be treated in the same way and thus made impervious to the attacks of insects. Wood of the cotton tree (semul) is very light, and quite suitable if properly seasoned; after being thus treated, and the blue vitriol not coming in contact with the honey and having no odour, nothing better could probably be used especially as the wood is cheap and generally considered worthless for any use. Toon too is good, but dearer, and there is no doubt there are many other sorts of timber which would suit the purpose quite as well, either treated as above described, or left as they are untempered against insects, if they be not attacked by them naturally.

There is also sola or pith of which hats are made which is suitable, when made thick enough, and covered with a good thick coating of paint to make it water-proof, and both painted inside and outside to prevent it being attacked by insects. The outer hive thus constructed is quite suitable but not so lasting as light wood. These are the substances which the amateur had best rely on for the construction of his hive, but solah when used

being very soft and when wet turning to quite a pulp, too great care cannot be taken that it is thoroughly and thickly painted (not with a dark color) light grey, light brown or any other light color. It is better made on a frame of bamboo work, and the solah mixed with paper, much after the shape of an English bee hive or it may take the form of any of those described below.

Considering that probably you may make your own bee hive, if you are ingenious enough and handy with carpenter's tools, you will require in a short time more than one, and it is best to have more, a short description is here given, also drawings showing the easiest forms to handle for the beginner, and how they should be constructed.

All the joinings must be perfect, and there must be no clefts likely to harbour the wax moths, which are sure to find their way to them, as convenient resting places. Supering is not at all to be recommended, and such hives are not to be considered as useful, as they will be empty nearly the whole time.

The extractor is far more useful and profitable, cheaper and more easily applied especially in the hands of an amateur.

If soft light wood is used in the construction outside, it may be $\frac{3}{4}$ inch thick or more, and the joins are thus more easily made; should heavy hard wood be used, $\frac{5}{8}$ inch thick wood would be quite heavy enough and require good carpentry in making the joins. All

nails and screws should be put in (if any) from the inside.

If any of the joins are defective, the gaps should be carefully filled in with putty or white lead. This point must on no account be neglected; however small the gap may be it should be *perfectly closed*, and in all instances seasoned wood must be used, as otherwise it will most certainly warp, making gaps in the joinings where none at first existed, and these will again have to be filled up. The corner joins will best be made by letting one board into the other, (thus in the drawing I & II), and the nails driven in obliquely from the inside.

If the hives are placed under a low shed, they need not be painted; but if made of light wood or exposed to sun and rain, they must be painted, and also in *different colours*, if there are many of them, and closely situated to each other. Under any circumstances *it is best to paint them*, to make them *more durable* as well as more pleasing to the eye; for as a hive grows old it gets unsightly, as well as less easily cleaned, which latter is an important point.

The dimensions of the external of every frame must be the same in the apiary, exclusive of the bar and a quarter of an inch from the sides of the hive, because if more space is left, the bees build it up with comb, and if less space be given propolis is built into it to fill it up. The amateur's attention is particularly drawn to this point as neglect of it will cause inconvenience and loss.

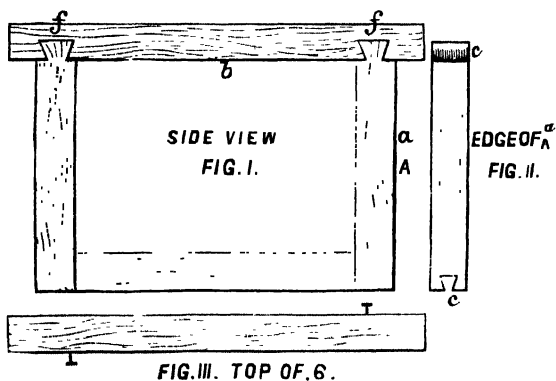
The frames should be all the same size.

The frames generally used by the British Beekeepers Association is 8" \times 14" excluding the length and thickness of the top bar.

Frames: how to make them.

The top bar should be just so large as to be easily moved between the sides of the hive, the latter (the hive) being 15 $\frac{3}{8}$ " inches. The wood of the inside of this hive may be $\frac{1}{4}$ " and the top bar $\frac{3}{8}$ " inch. The width of the frame may be one inch thick, the same as for English bees, and these should be hung $\frac{1}{4}$ " apart and up to $\frac{3}{4}$ " or little more.

The frame may be nailed or screwed together, but is best dovetailed as depicted below at cc and ff:—



after which a nail may be driven in at each joint:—

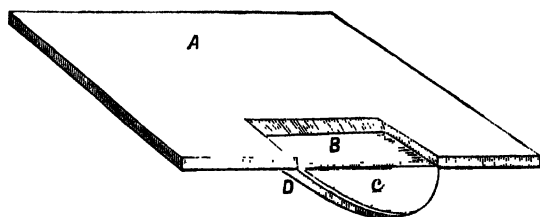
It is best to leave the wood unplanned inside, as it gives the wax a better hold, yet there must not be holes

or saw cuts in this for wax moth to lodge in. If nails be driven in on the sides of the top bar (one on each alternate side to a proper distance) as in Fig III., the frames will be kept paralled and at the right distance to each other, that is, you have a choice of keeping them at $\frac{1}{4}$ " to $\frac{3}{4}$ " inch apart.

The hive is the matter now to be discussed in its forms, horizontal, etc. First the Horizontal hives: how to make them. horizontal hive in its simplest form, is simply a box single walled with a roof 6 inches deep to allow for feeding and supering (which latter point will not be explained here) and it has a floor board. These are not suited to this country at all, but the double walled or cased horizontal hive is so suited, and it is to this attention is now directed.

The outer casing covers the inner hive completely and this latter contains the frames and can contain two body boxes. The space left between the body box and casing is two inches, and this should be filled up with some non-conducting material, such as chaff, straw paper or the like. The floor-board should be made of one inch thick wood or more, and halved by sawing, and then fixed with the grain in a cross direction, or it may be made like a drawing-board with two battens across the ends to prevent warping, it should have as well two battens below to strengthen it; which, if placed six inches apart, and be a little long support the flight-board. The floor-board is cut with

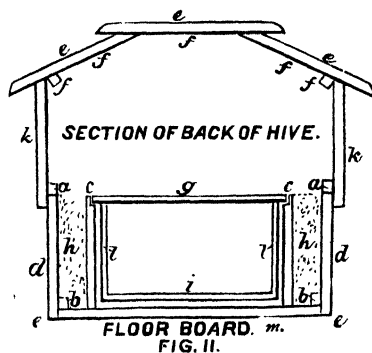
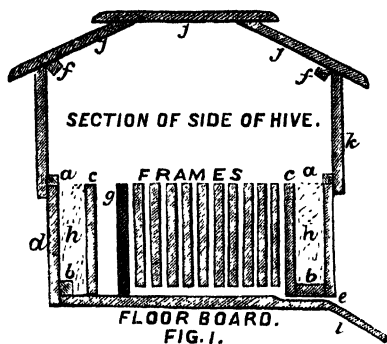
a groove eight inches wide and three-eighths of an inch deep as an entrance, and the ends of the battens are sloped off and a semi-circular flight-board, eight inches by four inches, is screwed on to them, sloping 30° or so. See *Sketch below*, and also in section. Fig. 1 in the figure



- A. Floor-board.
- B. Groove cut out of it $\frac{3}{8}$ " deep 8" wide.
- C. Flight-board 8" by 4" sloping about 30 degrees.
- D. The batten below, to which flight-board is screwed.

below of the horizontal hive and Fig. II, of the horizontal hive, where it may be seen in elevation, describe it better than any writing on the subject. The inner box to contain the frames is made of $\frac{1}{4}$ or $\frac{1}{2}$ inch planking, because it is protected from the weather by the outer body box, and the inside measurement of the same should be $14\frac{1}{2}$ inches by $8\frac{3}{4}$ inches deep, and it may be $14\frac{1}{2}$ inches long or say an inch or two more. It is advisable to keep to one size, and if a standard frame be put into such a box as above described, there will be $\frac{1}{4}$ inch between the hive and

frame sides, and $\frac{3}{8}$ inch between the bottom bar and floor-board.



The sketch will at once show by the numbers that the hive is built in five pieces.

Outer side of hive *d*. Outer side of hive *k*, which rests on *d*, lapping over it on batten *a* which is nailed on all round *k*. Top piece of hive or roof which lifts

off it to examine bees *e*. Floor-board *m*. Inner hive which contains the frames *l l i g*.

Below outer side of hive marked *d* is a batten *b*, which lets the floor-board into the box on all sides. The small entrance in front for the bee-hive, where the floor-board is cut away, as previously described and in this sketch is marked *e* (Fig. I.), and *ff* are battens nailed on to the roof to keep it in exact position.

The sketch shows the batten *b* at the entrance which must be, as shown, added to prevent the bees from getting between the inner and outer hives into the chaff or straw kept there as a non-conductor of heat or cold. The dummy is so made as to shift according to the size of the swarm or stock, so as to enlarge or contract the hive, and is at the back of the hive.

When a single hive is constructed, the outer walls will be of the same dimensions inside as the inner hive here shown. The total height of the two outer walls of the hive will be 18 inches, or, in other words, the two boxes with the bottom floor-board which they cover and without the lid or roof will be eighteen inches when finished, and one box fitted on the other.

Either a single hive or a double hive may be doubled by placing another similar box on top of these.

The frames having been put in are covered with a quilt to prevent the bees getting higher than the frames, and it is best to have a bag filled with chaff or saw-dust or the like by way of a pillow to put over the quilt as a non-conductor. In the quilt a hole is cut about three

inches in diameter, through which the bees can be fed at one side of the hive above the frames, so that it be most handy to get at and to recover with folds of the quilt of the same material, and also that it may be shifted to the back or front of the hive as desired. The feeder may be placed between the quilt and covered with the chaff bag. The space, if any, should be left between the dummy, and hive walls should be filled with chaff or whatever non-conducting material is used.

The upright hive is just a cup-board opening with a door. The door is the back of the hive which is opened by a lock and key, and in it may be two tiers of frames, one above the other; the space between the top bars of the lower frames and the bottom of the higher ones should be $\frac{3}{8}$ inch, and the depth of the hive from front to back may be 12 to 14 inches and when there are not many bees only the lower tier is used, a quilt being laid over the frames, and a dummy may be inserted if necessary just as in the horizontal hive described; when both tiers are used, a longer or high dummy may be used to fill up that space at the entire back of both tiers of frames. These dummies, being fitted with a frame of glass in the centre, admit of the bees being seen at work, and a small flap hung on leather hinges made at the bottom of the dummy is an improvement, as it allows of putting in a scraper to clean the hive without any inconvenience. This hive is packed just the same as the horizontal hive with straw or similar non-conducting material between the inner and outer hive.

Bees are conveyed in a portable hive, which is simply a light box to hold the frames, with perforated zinc on two sides and the top. It is most convenient to have them made to hold standard frames, and these not more than two inches from the bottom. There should also be room for two more frames. All the frames should be fixed by blocks so as not to swing, and there should be a screwed-up opening to allow the bees to fly at the bottom, so as to let the bees fly *en route*, if such can be done, or immediately on arrival. A bottle with a small hole in it may be inverted in the box, or a damp sponge applied to the perforated zinc from time to time. The bees should be fed with solid candy or thick honey in a comb. One thing imperative is that the combs the bees are supplied with are good old tough ones, such as will not break up on the way.

Nucleus hives.

The nucleus hive is only a very small hive containing three or four standard frames.

The entrance to this hive must be small—half an inch is enough. Any ordinary hive divided off and with a separate entrance to each division of nuclei will do, covered with a good quilt to keep in heat; and each division must have a separate hole in the quilt to feed through.

A queen's box is a small case, two to six inches in size, ventilated with saw cuts, fine meshed wire cloth, or the like. The queen bee is put in with twenty or more bees,

Portable hives: how constructed.

A Queen box.

according to the temperature, so that they may form a cluster, and they are provisioned with candy, and a small bottle of water with a hole in the cork.

Sections are now used instead of Glasses, which proved unsatisfactory, because they contained more than the retailer could sell without breaking up the comb to get a part of the contents.

In the vertical hive comb may be taken in these sections in the upper frames, or in the lower portion by using wide frames in these sections.

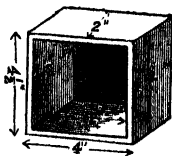
In Germany and Italy three tier hives are used in which the top frames are shallower than those below.

The upper tier is called the honey room, and takes the place of the super used in the horizontal hive.

To avoid the use of two sizes of frames in the same hive, a sectional rack of frames of the same size as ordinary frames may be used with advantage.

Section frames are small open frames, each of which hold one or two pounds of comb honey.

These are constructed of $\frac{1}{8}$ " wood, the sides being 2" wide as here depicted, and will contain 1 pound. Two pound sections are 6" x 5" inside, the top and bottom

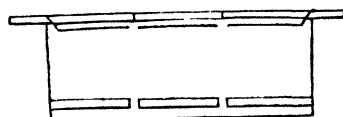


of the 1lb. section and the bottom only of the 2lb. are

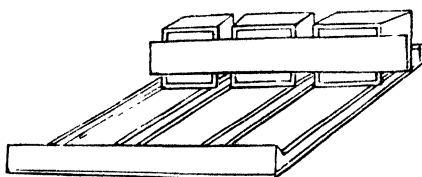
1 $\frac{3}{4}$ " wide, the $\frac{1}{8}$ " on each side being allowed as a passage for the bees; each passage is obviously $\frac{1}{4}$ " between the sections. "The 1lb. sections are sometimes put in two or more tiers, hence the top and bottom both afford passages for the bees: larger sections are generally used in one layer: only the bottom therefore is made narrower."

"One pound sections are worked inside the hive by putting three or six in a frame, two inches wide, hung at the back or front of the hive or both back and front" (see

Sectional frames and separators.



TIN SECTION FRAME



SECTION RACK PARTLY FULL

drawing above). "They are worked on top of the frame by being placed in a Section rack, partly full," as shown above. The rack raises the sections $\frac{1}{4}$ " above the frames, leaving this passage for the bees. "They may also be worked on the top by putting them into frames each containing three, and placing these frames on the top of the hive; in this case they must rest on $\frac{1}{4}$ sticks laid across the frames to form passages."

“Large sections or frames of small ones may be kept together on the hive by a string passed round them.”

“The end sections, whether in a rack or not, are best closed by pieces of glass through which the interior may be inspected without disturbing the bees.”

These sections are not worked flat separately unless separators are used.

Bees sometimes will not work supers ; the sections are then inserted in the hive below, and when the bees begin to work them, they are removed above, with the bees on them, and replaced by others in the lower hive ; these again, as they are worked are also removed above till the top is full. The most convenient frame for working sections has been shown in the above drawing. It is made of tin ; the sides are 2 inches wide, the bottom $1\frac{3}{4}$ inches ; it is open at top. The separators are soldered on, the section-boxes being simply dropped in from above them. By this method (useful in any form of hive) the sections may be finished in the hives or the frame after having been begun below.

These sections when worked are disposed of in the market in the following way :—A piece of glass is fitted to each side, gunmed or pasted round the section-box with some colored paper.

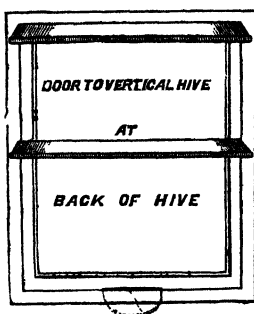
As some readers may prefer the vertical hive, a drawing is given of it here. It may be ornamented according to liking. The inside is worked on exactly the same

When bees will not work
supers.

Vertical hives.

principles as the horizontal hive, a lower frame being used and the upper portion being worked too, when necessary, as has been described.

ELEVATION OF VERTICAL HIVE.



Entrance like this, at front of
hive—with a flight-board.

It being necessary to use smoker, a bellows-smoker may be purchased, but it is not absolutely necessary unless for

large apiaries. The bellows-smoker gives lots of smoke, and keeps alight a good time; it should be so constructed and used, as not to emit sparks, much less flame. Also it should not be liable to get hot, and should be light and handy.

Those who smoke can readily blow a little tobacco smoke from the mouth, which serves the purpose; some blotting paper rolled round a pencil many times and the pencil then being extracted can be used as a tube to blow smoke from the mouth to any required spot in the hive.

A tin mug lined with clay and covered by a perforated or gauze wire front makes a good smoker, and

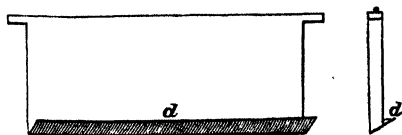
having a hook to hang at the side of the hive will aid to its being handy.

Some common tobacco leaf in a bamboo tube, with a gauze wire over the front of it to catch sparks, also suits the purpose and as long as there are not many bees. this serves all requirements.

Feeders for bees are of various sorts, but a simple pickle bottle, having a large mouth, will answer. The stopper should fit well, and be well moistened with syrup or honey when in use.

A hole should be drilled with an ordinary drill at the bottom of the bottle by keeping the drill wet with turpentine while drilling. Putting a finger on the hole, the bottle may be then filled with syrup or honey, and the stopper carefully fitted. While the stopper is in, it will not leak, and it can be quickly refilled when on the hive. Several holes can thus be drilled in the bottom of the bottle, in which case rags should be fitted in these holes to regulate the quickness of feeding. The lighter the rags put in, the less syrup will escape.

A tin fountain made like the sketch below, is useful. It is hung in the place of a frame, a piece of thin wood being floated at *a* in the sketch over the syrup for the bees



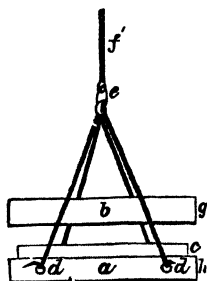
to stand on while feeding.

A tin in which jam has been used, is a very good feeder, when holes are bored in the bottom and rag or wire drawn through the holes to regulate the feeding. The bottle and last-named tin feeder are used to feed through the hole in the quilt over the frames, and are most handy.

The extraction of honey from the honey-comb without injury to the comb is an important matter, and many sorts of extractors have been invented, which can be purchased with descriptions of how to use them. They are all more or less on the same principle which is, to swing the comb round and round so as to impel the honey out of it by centrifugal force.

A shallow tin vessel with a lid, and a wire meshing, which goes between each vessel on which the comb is laid, suits the purpose

A rough and cheap extractor.



Lid of extractor.

A rim here inside to rest wire meshing upon, to lay comb.

Honey receiver.

(a) honey receiver ; (b), the lid, (c) is where there should be a small rim upon which to lay the coarse wire meshing and on which is laid the comb ; (d) (d) will be three or four little rings at the sides to which some string is

tied all meeting at *e*, where they are attached to a swivel, to which string is again fastened at *f*. This portion being held in the hand is swung round the head till the honey is extracted from one side of the comb, and then the comb is reversed to extract the honey from its other side. By this means honey is extracted rapidly enough for ordinary purposes, but if you have a large apiary, it will then be necessary to purchase a regular honey extractor, such as Mr. Douglas recommends as sold by Messrs. Abbot & Co., England.

Comb boxes are simply boxes like the frame box of a hive, into which the frames may be suspended ; each has a lid to close it. It is best to have one or more of these at least, because in carrying away comb the bee-keeper is inconvenienced by the bees, moreover, if honey is spilt, it is likely to induce robbery among the bees.

The queen cage is to prevent the queen bee from being killed when she is put into a hive, where she may not at first be graciously received, also to prevent her going away when it is desired she should not.

One of these is called the "pipe cover" which is merely a tube made of perforated zinc 1" to 1½" in diameter and ¾" deep. A little wire gauze can if wished be pressed into the same shape by hand, and will suit the purpose when clipped round the edges with a pair of scissors. The queen is placed in this and kept in by a piece of card or tin. If a cage be made entirely of wire gauze it only requires to be pressed into the

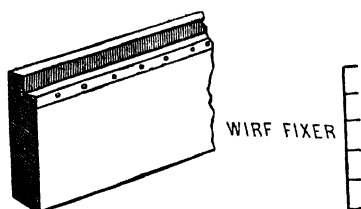
comb over the queen, screwing it round gently while doing so.

A glue pot is all that is necessary for melting wax.

To melt wax for foundations, or any other use.

Starters are made by smearing the lower portion of the top bar of a frame with melted wax.

For fixing foundation and comb, fixers are handy such as sketched below



A stout wire is bent to fit over the top and bottom bar of a frame, and small pieces of thinner wire are soldered on so as to be at right angles to it. The comb is simply stuck on the points so as to touch the top bar, and the fixers are removed in a day or two, when the bees have done their own fixing. Melted wax is also used for fixing comb and foundation, but care must be taken to see that the fixing is secure, or it may be tied round with cotton thread.

Fixers.

Bees must not be put into a hive without a guide, as there is no certainty how they would build: the lower portion of the top bar should therefore have even pieces of comb attached to them with melted wax. If there is no

Bees must not be put into a hive without a guide.

comb at hand, the centre of the lower portion of the top bar may be painted with melted wax. The next best substitute for comb is artificial comb, which cannot however be got the proper size for *A. Indica*; the cells of *A. Mellifica* being somewhat larger, induce drone breeding when used for the former.

Foundation is a piece of wax with the impress of the bottom of comb, but sometimes

Foundations.

this impress is made flat, at other times round like natural comb, and it is made of the proper sizes for drone or worker bees; thick for brood combs or thin for supers. These sorts of comb are made between engraved rulers, the wax being thus impressed in sheets, and it is yet though less often made by pressing wax between plates. Bee-keepers make it now with moulds of plaster of Paris wetted to make the impress with melted wax. Sheets will probably before long be ready for purchase of the proper size for *A. Indica* workers. That for the English bee is of the proper size for the drone bee, of *A. Indica*.

Plain sheets of wax are made by dipping smooth wetted boards or sheets of zinc into melted wax, and then dipping them in cold water. These may be impressed with stereoplates or with rollers covered with a solution of soap or starch to prevent the wax sticking to the rollers or plates. Plaster of Paris is the best thing to make moulds of

How plain sheets of wax are made, i.e., foundations.

How to make artificial comb.

for manufacturing comb or foundations in small numbers. "To make this," Mr. Douglas writes, "make two frames of wood and hinge them together to open like

a book, fit a board in one, lay a sheet of foundation on the board, and close them together, now fill the one with plaster, and when the plaster has set, reverse the frames, remove the board, and fill up the other side with plaster: when this has set, smooth off the backs of the moulds, open the frames, and remove the sheet foundation."

"The following precautions are necessary for success :—Do not use the plaster too thick, use a very thin oil to grease the foundation sheets, removing all superfluous oil with a sponge; when pouring the plaster, pour a little, rub it in with the finger to remove all air from the cells, then fill up and fill the mould well as the plaster sinks; do not open the mould until the plaster is quite hard." "After the plaster is quite hard, the mould is used as follows: soak the mould in water, lift and drain it, then holding it three or four inches open with both hands, dip the hinges three or four inches into melted wax; close the mould, lift it out, and dip in water; on opening it, the sheet of foundation may be removed."

"The wax is best melted in a double tin vessel, and it should not be too hot. Comb built from foundations is more regular than natural comb, and the use of worker foundations enables the bee-keeper to control the building of drones' comb: it is also necessary for getting the beautiful white super comb honey." A great deal more even than here mentioned is secured by the use of artificial foundations and combs, as will be readily seen by the reader who has perused these pages thoroughly.

MANIPULATION OF BEES AND BEE-HIVE.

CHAPTER XX.

It has been described before that the bee-keeper must, at all events at first, if he has no confidence in himself to face the bees with courage, wear a veil over a broad brimmed hat, to keep it well away from the face, especially the nose. The veil must then be fixed under the collar of the coat so as not to admit bees either at the joining or under the coat collar. The sleeves too should be tight at the wrists, and good thick woollen gloves dipped in water, fitting well at the wrists, are useful. With this armour the novice may deem himself quite secure ; if he is stung, however, though the swelling at first may last for a few days, the same causes no great harm and each successive time the bee-keeper may be stung in the future, the sting seems to have less effect.

Bees being effectually intimidated by smoke are then knocked down by tapping sharply on the branch or whatever they may have clustered upon, into a hive, box, or whatever may have been brought to secure them. How

to capture a swarm has been described in the first few

pages of this small work on bees.
When smoke is used and is useful.

For some purposes smoke has to be used plentifully, for instance if they are seen fighting when one hive is united with another artificially, or to save a queen when she is newly put to a hive and the bees attempt to smother her, which latter is called balling the queen, or in transferring when bees have to be driven from comb to comb. At such times when manipulating, the head is best covered with a veil, as bees get entangled in the hair, and will, when thus teased, sting the manipulator.

Young bees seldom sting, but old bees will not allow such a liberty to be taken with them.

To watch a hive, stand at the back or at its side, but never in front of it; and after manipulating a hive it is wise to see that young bees not being so active as old ones, have not crawled on to the clothes, and remained there.

To open a hive, always stand behind it, and never throw your arms about; bees dislike these quick movements, they also dislike one to breathe on them or to come in hot haste and perspiring up to the hive. Loud sounds too which irritate them greatly.

When examining a stock, take off the roof gently, or
How to examine a stock. if it be a vertical hive, open the back gently and uncover the quilt over the frames quietly and steadily by removing one corner at a time, then the other, not pulling it up but as if tearing it off, because it is stuck most probably

with propolis. If the hive is not full, shove the dummy back to make room, and if be full, lift one of the frames out with the bees on it, and examine the bees at work; stand it against the inside of the hive or against the post. Examine the next, but do not jar or shake the comb; it must be held firmly and steadily. Best of all in taking a first frame out of a full hive, you may put it into a comb-box. If you hold the frame steadily, you may see the queen and will see the workers at work.

The frame should be held just as it hung down in the hive, for if it be tilted when heavy and full of brooder honey, it may break and fall out of the frame.

If you go on examining these, place them one by one on the sheet. But you should have first made up your mind if you intend to use smoke, and should then have just put a gentle puff of smoke in at the entrance of the hive and while you are manipulating, if the bees show any signs of rising, a puff of smoke blown on them from where you stand at the back of the hive will send them down.

After you replace the frames, put a puff or two of smoke in among the frames, which will make the bees go down. Give them a little time to do so and cover them up with the quilt. Finally cover with the lid of the box.

A vertical hive is rather more difficult to handle, because it is not directly below for inspection, but in front of you.

When cleaning the floor of a vertical hive, it has to be scraped with a bent piece of iron or hoop iron through a slit at the back of the dummy. A horizontal hive is cleaned, by lifting the whole hive up, and putting it on a sheet of paper; and then scrubbing and returning the floor-board, first closing the entrance to the hive.

When administering smoke to the bees, numbers of them may be seen moving their wing: that is not a sign they intend attacking, but that they are frightened and intimidated.

When bees are intimidated they move their wings rapidly.

Salicylic Acid solution should be used to disinfect hives once used, and all boxes in which bees have been confined should be burnt up. Wax moth should be cut out of combs with a knife or bamboo knife, which any one can make.

Transferring has already been referred to, and if you can examine a hive you can also transfer it.

Uniting is done to keep bees warm during the inactive season, and also to make strong swarms either for honey or breeding, but not necessarily so in the latter case. In summer it is done to get a large quantity of honey. Sometimes an accident to the queen renders it necessary to unite swarms.

When uniting should be done.

Loss of a queen caused by absence of drones, and when no queens can be bred or no queen is not available. It may be that the queen gets lost in the

summer, when she goes out to meet the drones or she may die in winter, or she may grow too old to breed.

Uniting is also done to create small ones of nuclei. In uniting, bees, when once united, may separate and go back to portions of their old swarm in their old hive. They sometimes fight, then smoke must be used to quiet them; sometimes they may destroy the queen, in which case it may be avoided by first caging the queen and seeing their behaviour before releasing her, or by smoking them when they attempt to cluster or ball her.

It is always best to use smoke first before uniting, or one hive may be gradually appropriated to the other, on days they do not fly, by taking a frame or two from one hive to the other at one time, and also by bringing the two hives together gradually by moving one hive towards the other by small stages; not more than three feet at a time must be the change made in one day.

Uniting bees. how to do
so in stocks.

By smoking well in both hives before uniting, the bees lose their identity. When the stocks are being united, one queen will kill the other: it is best to cage one of them in case of the other being killed by accidental fighting, etc. Also it must be borne in mind the fertile queen, being the least active, is liable to be killed by a virgin queen, because she is less active than the virgin queen. Smoke the bees, syrup them, that is, sprinkle them well, preferably with scented syrup, (in both hives) and pour the contents of one hive of bees into the other, after about ten or fifteen minutes, by which time they will be quite full, and disinclined

for combat. In the meanwhile you must have arranged the combs, placing them alternately, the brood comb in the centre; at this stage you secure the queen and cage her. If fighting takes place, smoke at once till they are quite friendly.

When there are too many combs for one hive, remove some of those containing honey.

Swarms that have issued on the same day may at once be easily united by securing them shaking them into one hive and mixing them well up together by dropping first a portion of one swarm and then a portion of the other, and so on. This should be done on a mat in front of the hive, the body-box of which is raised, and when the bees have got into it, they are put on the stand in the hive. These swarms are very full of honey, and are, therefore, readily received.

When a queen is caged, she should be put on a brood-comb, if possible, and so that she can get food. When releasing her, watch if they try to ball her, and if they do, smoke them at once.

This may in some cases have to be done many times when the bees will not receive a queen; in such a case, if the queen be a fertile one, all endeavours should be made to save her, because by the bees' refusal, the virgin queen is exposed to the chances at least of being lost on her wedding tour.

Swarms may be united.

To introduce a new queen to a hive.

How to do so.

Old worn-out queens have to be replaced. It is best to replace a queen after the third year ; young bees readily accept a queen. Old queenless bees sometimes fight badly, especially if they have been long queenless. The latter are given brood and when these are hatched, the queen is given ; but it is advisable to unite these old bees to another stock which has a fertile queen, and when it is done, cage the queen on a brood-comb, first syruping the bees and removing all queen's cells. If the bees cluster on the cage, do not release her, and do not let the bees breed a queen (by cutting out queen's cells).

The queen should be in the cage twelve to twenty-four hours to let the bees know it. Sometimes the queen is caged forty-eight to seventy-two hours or more, if it be found she is attacked.

Precautions for the new queen's safety.

If it appears she has been safely introduced, the hive should be examined again in half-an-hour's time and again next day to see if the introduction has been successful.

How to know she has been safely introduced.

Sometimes the queen's wings are clipped to prevent her flying away, as she may do at these times. This is done in America.

The combs at the back of hives or those in double hives on the top are those which are removed for honey. In removing them, they should be put into a comb-box to save honey from being spilt, to prevent the bees from beginning to rob, and for the safety and convenience of the bee-keeper.

When extracting the honey, cut off the caps with a long thin honey-knife, or any other long knife, warmed by dipping into hot water; if there is brood in the comb, cover it with a cloth and then place on the extractor, both to save the brood and to obtain clean honey. Extracting must be done at once, if there is brood in the comb, and it is required to save it. It should be returned after the honey has been extracted from the other portions of the comb not containing brood, and care should be taken that the caps are not cut off the brood-cells. The combs, after extracting the honey from them, should be returned to the hive, and it must be remembered that the hive must be crowded before honey is taken from it. If the hive is not crowded, the size of the hive must be reduced by moving the dummy until it is quite full. Then only may super-honey be taken by inducing the bees to go upwards to sections, or the brood-combs may be placed in the centre of the frames below, and some sections placed on each side of them in the hive. Supering is only done with strong stock. The bees are induced to do it, by partly built supers being put there; or supers (sections) begun below, and removed above afterwards when started.

Directions as to how to treat brood-comb, when extracting honey.

When super-honey may be taken.

Separators should always be used, and drone-comb may be used, but if there is no drone-comb in the hive, the queen may drone brood in them.

Cover supers up warmly, so as to prevent the bees from going down at night. As the sections are filled, take them out and replace them with new sections.

Sections put on both sides of brood-comb in the lower comb, should be hung on section-frames crowding the bees well, when necessary. Super-comb should be removed immediately it is capped by the bees or it gets discolored. In removing frames or sections tap smartly or shake with a sharp vertical motion, so as to drop the bees into hive, and wipe off any that remain with a wetted feather or bird's wing ; or they will fly off when the whole super crate be removed at once if it be taken into a room and allowed to cool. Or the supers may be put into a dark box with a number of corked-up in holes in it ; one or two corks being removed, the bees will fly away. If the bees are seen to re-enter, close the holes already opened and open others.

The best method is that first described. Doubling is done to get numbers of workers together. By so doing *temporarily*, there is an immense increase of workers to get honey from, but there is only one queen, and not much consumption going on, while there is also *comparatively* little breeding because there is only one queen laying. Doubling prevents strong stock from swarming, which is an important advantage.

It should be only done *when lots of honey can be got in*, and to prevent swarming.

To double, select a strong stock with plenty of brood, remove the brood-combs to an empty body-box, and place this on top of a second strong stock, filling up the hive from which you have taken the comb, with empty combs or foundation.

Doubling is done when it is necessary to get honey, and when increase of stock is not required.

In removing hives, great care should be taken to not move the hive more than three feet at a time, that is, if they are to be removed a short distance.

For removing a hive a long way, it is best to use portable hives, in which case precautions are necessary. Ts should be fitted between the frames to prevent their swinging. See to ventilation being *amply* sufficient, and feed with candy or honey.

When queens are transported, always have twenty or thirty escorts confined with her, and more if the weather be cold : often over one hundred or more are necessary, if the journey be a long one. Young bees are the best to give as escorts.

The breeding of bees must be practised by the bee-keeper to keep up his stock. On the Continent and in England, breeding bees is done as a source of profit. Breeding must be carried out in the middle of the season, not too early nor too late, or much life is sacrificed.

The warmer the situation, the longer breeding can be extended over the season ; continuous breeding, however, soon wears out the queen, which has then to be more frequently changed. Bees will breed when the weather is warm, and there is plenty of food and a sufficient number of them to give warmth by covering the brood. For rapid breeding, there must be a certain proportion of old and young bees, specially the latter. Crowding is necessary over the brood-combs, expanding only as there is more comb as the bees fill the space. A minimum of three frames is given for breeding, and only as

many as the bees can cover. If these cannot be covered, the combs must be cut of honey, for an inch or two.

If there is capped honey, uncap some of it as fast as it is capped. If the bees are not getting pollen ready, put some *sectto*, wheat or pea flour in the hive. If there is no honey or honey to uncap, feed with syrup slowly, for if fed fast, the bees will fill their combs with honey; keep shifting the combs in the hive every eight days or so.

In three to four weeks the brood will be hatched. Meal may then be given outside the hive, mixed with grass, chaff, leaves or shavings for the bees to stand on.

To stimulate them syrup or diluted honey is given in small quantities for a fortnight or so, and the extractor used to make room for brood.

Combs of brood are given to weak stock to rear while they are fed, and swarms are assisted by slow stimulating feeding. Weak stock should have their honey uncapped to stimulate them.

Drone breeding may be kept down by using their combs for honey and using worker comb. Only a little room is left for drone-comb, or only a little drone-comb is given. Excessive drone-brood is stopped by cutting off the cells, and thus beheading them, or by sprinkling cold water over it, and leaving it for the bees to clean out.

The measures are seldom necessary. Drone-comb may be placed outside of brood-comb, where it will not be used for breeding.

To breed workers crowd the bees, give worker comb,
Worker breeding. and give stimulating food. To
 breed drones, give worker comb,
 crowd, and give stimulating food.

To breed queens: when the eggs are not more than
Queen breeding. three days old, remove the queen,
 when the bees will immediately
 begin to build queen-cells, and real queens. A strong
 stock is always thus treated, because it stops the laying
 of eggs by the removal of queen.

Queens cannot be reared unless there are drones or
 drone-brood.

When you have removed the queen, feed and also
 give meal till the queen-cells are capped, if honey and
 pollen are not being brought in in large quantities.

QUEEN RAISED FROM EGGS are generally considered
 better than those from larvæ. To
Queens raised from larvæ
 and queens raised from
 eggs. get those produced from eggs, "cut
 holes in or cut off the edges of
 combs containing eggs, so as to bring the eggs near
 an edge: this comb being inserted in the centre of the
 brood nest, queen-cells will be started at the cut edges,
 and in seven to eight days these will be capped over,
 when they will be available to remove to other hives,
 or for furnishing nuclei. If all but one be removed, the
 one remaining will furnish a new queen for the stock
 hive."

When a large number of queens are required, all the
 first batch of queen-cells must
When a large number of
 queens are required, how to
 breed them. be removed and a comb taken
 from another hive, treated as
 above described, and inserted for more queen-cells to

be made on it in the same way. When removing a queen-cell, cut it with a pen-knife, leaving a triangular piece attached to the queen-cells on the upper side of it, the base of the triangle being on the top. Care must be taken not to squeeze the cell, and in grafting it on to put it on with a cut similar to the triangle, or they may be pinned on with an ordinary pin passed through the comb portion.

Cut out one cell at a time, and pin that one on before beginning to cut another out to affix.

It is necessary not to expose the cell to sun or to chill.

Bees of a stock do not always produce the same
Differences in the progeny of bees. tempered bees, nor bees of equal beauty or with the same powers of excellence. That is to say, they vary. Thus the progeny of one queen may be more beautiful than that of another, or they may be better workers, so that these points of excellence have to be looked to in perpetuating stock, and the bee-keeper may improve his stock by the introduction of such stock. Breeding, however, is not always controllable, as the queen may be impregnated in the air while flying. Then again the drone progeny is not effected by the union, because a queen can lay drone eggs without being united to a drone.

A queen, the mother of hybrid workers, is at the
Breeding from different varieties or in the bee-keeper sense of the word, producing hybrids. same time the mother of pure drones after being impregnated by a drone of a different breed.

A queen of *A. Indica*, being impregnated by a British black bee, will produce hybrid workers, but the drones will be pure *A. Indica*. Mr. Douglas says :—"To breed from two selected stocks stimulates breeding," and again "and breed drones in one stock as early as practicable before the other stocks have drones ; then remove the queen from the other stock and breed queens in that stock : the queens will necessarily be impregnated by the drones of the first stock as these are the only drones flying."

When a new stock is introduced, an impregnated queen is generally sent with it. How to proceed in introducing any new breed. As the old bees die off they are replaced by the new variety imported.

Thus, if a fertile queen of a new variety be introduced, and young queens, her progeny, be fertilized by drones of the old variety, the drone progeny will continue of the new variety, but the workers will be hybrids.

Queens, which have been bred from the first queen, may be impregnated by drones of the young queens ; the progeny of the new variety will be pure, although related to the hybrid workers.

TO INCREASE STOCKS, FEEDING, CONCLUDING REMARKS.

CHAPTER XXI.

To multiply stock, you must, as things are at present in India, as regards bee-keeping, be obliged either to breed your own stock, or to increase it by the addition of wild bees caught when swarming, or when they are on their hives, the latter operation being performed during the evening, as recommended and explained in the first chapter of this small work.

Practical experience of keeping bees in India may be supplemented by reading theoretical English, American, and German books, but practical experience of working in India must be gained in order to succeed and to make bee-keeping, when practised for profit, remunerative as a business.

There is no doubt that it is admirably suitable to certain classes of ryots in India, and that one day it will be one of the industries of the country, but not until it is known to these men *how to cultivate and keep bees, not only to encourage bees, as at present*, as is done by the Hill men of India.

If your stock is not strong, you must make it so before thinking of taking honey.

With the wild bees you get, you have to contend against their instinct to swarm; you must domesticate

them as others have done. There is no infallible means to prevent their swarming; but still you have strong measures in your hand, with the queen, extractor, broodcomb, artificial swarming, doubling, giving room, in the hive beyond what is required, and shading the hive, all of which will help you.

When a swarming has taken place, the bees should be united to stocks that have swarmed, and if there be two swarms the same day, they are most readily united. The American practice already referred to may be followed, *viz.*, the queen's wings may be cut, and as in consequence she cannot go far, the swarm may be captured and brought back.

By keeping a few packing cases, boxes, or bee-hives about (with holes bored in the boxes or cases for ventilation and to let in the bees); and by placing them bottom uppermost and with pieces of honey-comb with honey, in or under them, bees may be attracted to them, and swarm to these places.

When a swarm has taken possession and have clustered, they should at once be transferred to a hive, as they will soon be far more difficult to handle, because the surfeit will be over, and they will be once more active. As these swarms have to build combs, much time is gained, and much honey, by giving them combs in which the queen can lay at once. They should then be fed. If they are not required separately, they may be united to other stocks, and to prevent further swarming, cut queens' cells out from the original stock; a

brood-comb should be put into the hive, if there is none.

They should then be left with some food in a feeder, quite undisturbed for some days, or they may abscond.

After this, all extra combs may be removed for honey and the hive contracted, and in such a manner as to stimulate breeding.

Artificial swarming then is better than natural swarming, and is under control, so that these means may be adopted if the stocks seem strong and likely to swarm naturally. It interferes less than natural swarming with the honey harvest. This must be done on a fine day; take one or two frames of brood-combs from each hive, shaking of the bees into an empty hive, and fill the remainder of the hive into comb or foundations. Then remove the hive of a strong stock from its stand, and place it on another when the bees are busily at work in the morning, placing the hive you have got ready in its place. When the old bees of the hive you have removed return, they will hatch the brood and raise a queen, or when you have a spare queen available, you can have her already caged for them on the brood comb.

Care must be taken that the day chosen for this operation is fine, or very few bees will be out, and therefore only a few will come to the new hive put in the place of the old one they occupied in the same position on stand.

On a fine day, in the same way, two hives may be divided off into three. From hive
To make two hives into three. No. 1 take some brood-combs without any bees, and put them into an empty hive, which call hive No. 3. Then take hive No. 2 and place it on a new stand, and place No. 3 hive on the stand of No. 2. It will appear clear enough to the reader that No. 1 in such case supplies the brood for the new hive No. 3, while hive No. 2 supplies the bees. If there is no spare queen, the new hive will raise one from the egg of No. 1 hive in the comb, now theirs.

Nuclei are formed by dividing one hive into many ;
Nuclei, and how to form them. and keeping a queen in each ready for any occasion is a useful way of proceeding. When a nucleus is formed, the hive will have to be contracted by putting the dummy well forward, and having only a few frames in each hive. Then the entrance too must be contracted so as to allow room for one or two bees only going in at a time: this to prevent strong stocks from robbing them.

Nuclei sometimes dwindle from the old bees going
Accidental dwindling of nuclei and how to obviate it. away to their old hive, and leaving the young bees who, not having a queen, do not increase for some time : in such case, it is best to shake a few of the frames covered with bees from the hive they have been stocked from while stocking it into the hive of the nucleus. Or, the nuclei being prepared for some days previously to the removal of the queen from the stock which is to

furnish a queen, the queens' cells may then be cut out and supplied. Only one queen's cell is given to each nucleus.

“A supply of queens' cells is kept up, by keeping the queen rearing stock queenless, and giving it brood-comb for each batch of queen cells.”

A good deal of care must be taken in feeding, or robbery and the destruction of stock will take place. When a feeder is put in to feed a weak stock, the precaution must always be taken to make the entrance to the hive small, and then that such entrance, being easily blocked by one or two dead bees, be watched from time to time to see that it is clear. The feeder must always be in the hive, and covered up so that other bees do not get to it. It is necessary to give flour of peas, *dall*, wheat and the like for the brood, but that does not induce robbery; it may be given outside, but is more convenient inside the hive on the floor. These substances are used instead of pollen, for which they are substitutes: but when they (as also flour candy) are used on the floor of the hive, the floor of the hive must be cleaned at times to keep away insects that will try to get in for it and to tease the bees.

. Feeding during summer is to stimulate as well as to feed the bees, so that they may go on breeding, and they are therefore fed with thin syrup or thin honey; when autumn comes round, however, the

Feeding bees; precaution in so doing to save robbery and war.

Dall, flour, wheat-flour meal, etc., substitutes for pollen.

The different consistencies of food for the different seasons.

feeding being for their stores as well as present sustenance, thick syrup is then given, administered quickly.

Winter feeding is with candy, because liquid food reduces the temperature of the hive, and brings on dysentery; flour candy is good for spring feeding, because it is still cold at night.

During the inactive season, it is very necessary to keep bees quiet and contented; particularly where winter weather is experienced, such as in the hills.

It will appear obvious then that rather early, and before it gets too cold, they should be rapidly fed *with thick honey or syrup*, so that they have time to have a full supply not only stored away, but capped: because uncapped stores causes dysentery, which is quite as bad as feeding with thin food for winter. All uncapped stores may and should be extracted. As much as the bees may take of food may be then given to them, as they will take as much only as they require and no more; it is better therefore in such case to give too much than too little.

When spring has set in, each stock should be examined; and I may add that when the Indian winter and rains are over, each stock should be examined, and if there are not many flowers, they should be fed with flour candy.

During the winter the hive may be most beneficially wrapped up in mats or straw, or with rope made of straw, to prevent the cold wind from playing directly on it, and thus reducing the temperature; in such case

the consumption of food is much less. The hive must also have been well contracted before winter sets in. Strong stocks keep up the temperature best, and consume comparatively less food; almost 15 to 20lbs. is left to a hive for winter food; but a good deal depends on the stock in the hive.

During the rains on fine days, the hives may be examined, and, if necessary, a cake of candy put in under the quilt, over the clustering bees, but even in the plains it is not good to give syrup in the rains, because it produces dampness in the hive, and candy is just as easily or more easily given.

When feeding bees in spring, it must be remembered that dark sugar or honey should not be given to them, and especially not *burnt sugar or bitter honey*.

Food in spring, and injurious and bad food.

The bees must be fed with syrup of white sugar, and the hole they are fed through, should not be more than $\frac{1}{8}$ " in diameter, which will give them, say, about a wine-glassful of food in a day, and this should be continued for two weeks to promote breeding. At such a time the hive is contracted, and care must be taken to see that the bees are not filling their cells with honey: if so, uncap them, and, at such a time, feeding with flour is useful, say, a spoonful of meal in front of or in the hive. A cake of candy put in under the quilt too in spring is a very good thing, but do not put more than will do for five days' feeding at a time. Honey is the bee's best food; it is however very attractive,

Do not spill honey.

because it has a very characteristic smell and taste, which may at once induce robbery;

it must therefore never be given to the bees outside their hive. Spilt food will encourage theft, and that must be avoided ; if any is spilt, it must be cleaned up.

Bees must not be fed with molasses, because molasses contains burnt sugar ; crystalized sugar is also bad, because it is too hard for bees.

Molasses must not be given, nor crystalized sugar.

Sugar must be given as syrup or candy. Just a small trace of salt in water or syrup is considered good for the bees.

Salt.

Syrup made of a quart of water to three pounds of sugar is called thin syrup ; and one quart of water to five pounds of sugar is thick syrup. Thicker syrup than this should not be given, because it would crystalize and clog up the combs. Also some preparation must be made to avoid this as below :—

Syrup for bees, how to make it thin, and how to make it thick.

To prevent its crystalizing in the comb. Mix two table-spoonfuls of vinegar to ten pounds of sugar, and $\frac{1}{4}$ ounce table salt is then added with each quart of water. The sugar must be dissolved in hot water, put on the fire, and the vinegar added when it boils : keep on boiling for five minutes. The mixture is then allowed to cool, and should it crystallize, the vinegar was insufficient, and more may be added, more water is also added, and the whole reboiled.

The way candy for bees is made, is by putting a little water into sugar and stirring it continuously, over a fire, to prevent its burning. It is considered ready when a little of it being dropped on a cool surface turns solid and does not remain sticky. Half a pint, say, of water, to every four pounds of sugar boiled will turn to candy in a short time if dropped after boiling on a cold flag of stone or *pucca*. It is stored for use by pouring it into saucers lined with paper; the paper is left on it on the lower side and the candy is thus given to the bees; the cloth of the quilt over the frames being on the paper prevents the candy from making the quilt sticky.

The flour candy so generally mentioned throughout this article on bees, is candy, the same as above, except that when ready to be taken off the fire one-fourth of the weight of sugar is added of *dall*, or pea, or wheat flour, well stirred in to incorporate it, but not to cook it.

Should foul brood be present anywhere in the neighbourhood, it has been recommended to add Salicylic acid to the syrup, "an eight-anna piece heaped being added to every four pounds of sugar, or the Salicylic acid may be dissolved in a solution of borax. One ounce of a mixture of equal parts of borax and Salicylic acid is added to a quart of water, and one per cent. of the solution may be added to syrup to prevent foul brood."

This mixture of Salicylic acid and borax is also used as a disinfectant for spraying infected combs, hives, floor, boards, hands, and utensils.

The flavour of honey varies greatly according to the flowers from which it is gathered, and perhaps such variation is greater in this country than in England, as any one can easily judge for themselves by tasting honey made by bees in the hills or even in hilly country and in the Sunderbunds. There is a very marked difference even between the honey made by bees in the highland and that made in the Sunderbunds or in jungles on the sea coast of Chit-tagong. The former is much thicker and of a darker color, but scented: that made in the Sunderbunds is largely extracted by bees from the flower of the Goa, of which they are very fond. It has a lighter color, in fact, is almost white, and though also exquisitely scented has a completely different flavour.

Honey of different flavour and density.

The flowers honey is made from affects the flavour of honey.

Honey which bees make from the flowers of tea bushes, has a slightly bitter flavour.

Honey from the flowers of tea bushes.

Some honey is dark; some almost white or colorless, and again some honey is almost semi-solid and cannot be removed with the extractor, while some is almost like a watery syrup.

The generality of honey, however, is readily extracted, but when kept separates into two parts, called dextrose which crystallizes, and levulose which part does not form into crystalline matter. Such honey that separates with keeping is genuine, but it can be prevented from crystallizing by being kept at a certain temperature,

such as that of the hive. Honey kept in its comb does not readily crystallize.

Bazaar bought honey is largely adulterated with molasses, in fact so much so that Bazaar bought honey and its impurities, some samples will not be recognised to be honey by those who know what true honey is.

It must be remembered too that honey like fruit ripens, although those who eat it may seldom have the chance of knowing the difference. When taken from the hive, it is sometimes very thin, but thickens very rapidly and should be extracted at once; sometimes even before it is capped by the bees: what is thus taken, however, must be artificially ripened to prevent its getting fermented and acquiring the musty flavour of unripe honey.

Another feature met with in Bazaar honey is a muddy appearance which good honey should never have, and which is caused by the comb being squeezed, very often when it contains brood: such honey will not keep.

Unripe honey is thus treated to ripen it. If warm To ripen Honey for storing. weather, stand it in a bowl covered over with cloth to keep out the dust; if the weather is not dry and warm, so as to cause evaporation, it must be stood in a second larger vessel containing hot water, so as to evaporate all excess moisture before mustiness sets in: it must on no account be boiled. The nearer the temperature is kept to that of a hive, the better.

Honey, when too thick in the comb for extraction, may be warmed and then extracted, or the comb may be cut up and the honey then extracted by heat.

How to extract Crystallized honey.

Comb-honey, when thus kept, should be stored in a warm place, and the nearer the temperature of the store-room is to that of a hive, the longer will the honey keep without crystallizing. Fine honey which crystallizes, is none the worse for the change; it only shows it is pure.

Comb honey, how to store it

Tin is not the best thing in which to keep honey; it may, however, be used if first smeared with wax. When honey is bottled, it should be put into wide mouth bottles, and when they are full nearly to where the cork will come, a spoonful of melted wax should be poured on the honey which keeps it all the better.

The capping that is taken off combs before extracting honey, is pure clean white wax, and therefore should not be mixed with inferior wax when any is melted. No wax or comb should be kept lying about, both being very soon attacked by wax-moth and even small pieces of comb are valuable for use in frames. Wax once attacked by moth is worthless, because it quite loses its sticky consistency and crumbles.

Wax, how to prepare it for keeping or for sale.

Wax like honey differs much in color, some being almost white, while some is of a dark orange color. In preparing wax from the comb, so as to have it pure and

separated from all *debris*, it should be melted in hot water and kneaded under water, and there it should be pressed while hot through a fine gauze meshing of wire.

Once prepared, it should be put away in closed boxes to prevent its being attacked by moth. To give wax a clean appearance, it is mixed with one per cent. of vinegar, heated, and then strained while still hot.

SOME NOTES ON THE GENERAL MANAGEMENT OF BEES AND THE BEE HIVE, &c.

CHAPTER XXII.

THE amateur bee-keeper must recognise the great importance of saving the bees all unnecessary trouble, such as having to go long distances for water, etc. The same may be at the foot of the stand, or it may be put in any vessel with pebbles placed in it for the bees to stand on.

A great assistance to bees, is a garden close by and one kept filled with such flowers in beds as bees love to gather honey from, as mentioned in the list below ; trees also may be planted for their blossoms. Trees, flowering bushes and annuals are entered in the list, (as also vegetables) :—

Gardens of great assistance to bees and the sorts of flowers they like.

Willow *	Syringa	Wheat
Hepatica	Annual Poppy *	Vipers bugloss *
Violet	Sweet-briar	Raspberry *
Almond	Bean	Racemosa
Wallflower (single) *	Lupin (Yellow espe-	Michaelmas daisy
Borage	cially)	Ivy
Onion	Mignonette *	Honeysuckle *
Peach	Mallow	Hollyhock *
Turnip *	Lime *	Sunflower
Cabbage *	Nasturtium	Roses *
Pumplenose *	Broom	Stocks, and a hundred
	Lemon thyme *	others.

Those marked with an asterisk, bees are particularly fond of. The lime trees and pumplenose trees, when in blossom, may be seen swarming with bees ; so much so that the hum near them is like that of a hive.

Foundations and combs should be given to them, if you want to make bee-keeping a profitable speculation ; the entire outlay is very small, and the care you have to take will encroach but little on your spare time. The return is large when you have once established a stock.

But your stock must be strong before you extract much honey, or any at all, if you want to make the stock strong.

When the bees are few, you must feed them and rear brood ; without it at such a time they cannot succeed. Food must not be grudged to the bees when they require it.

The very best stocks should be kept to multiply stock so as to perpetuate all the good qualities you see evinced among the different hives.

If increase in stock is not required, then double so as to make your bees profitable. Thus you check increase in stock, and gain honey.

So that you may keep yourself thoroughly reminded of all important matters connected with each hive, keep a paper in the top space of every hive with notes in it ; such as age of queen : when

Foundations and combs should be given to bees.

Stocks of bees must be strong.

Selections should be made of stock breed.

Notes on each hive should be kept in them as being useful.

the hive swarmed last, and so on ; an account should also be kept of the weight of comb taken from each hive from time to time. You should have a separate account book for the apiary of all cost and yield.

You will do well by not disturbing the hives in winter.

Do not meddle with hives in winter, Once for the whole time of the inactive season you should have seen that they have all stores correctly and have contracted their hive, also you should have seen that the hive is well covered with mats or straw rope to keep it warm, and have contracted the entrance to keep out mice, cock-roaches, etc.

So small is the labour in looking after bees that it has been mentioned, "40 stocks may be attended to by a teacher, clergyman, or similar person in his leisure time without assistance," though it is true that an experienced person can do so with greater facility than a person who has had no such experience.

There being little expense involved makes bee-keeping the industry of the poor man, who cannot afford outlay either in cash or by borrowing.

That bee-keeping is an industry admirably suited to the poor.

In India, where much knowledge of the honey bee has yet to be acquired, do not try at first to get super honey ; use the extractor, which is far more profitable. By it you will get twice the amount of honey you can get from supering, which will certainly make up for the deficiency in quality (if any).

The hive must be placed, so that even in passing and re-passing, a casual look at them at once keeps you informed as to how they are progressing.

In India especially the extractor is of great use to keep down natural swarming. Artificial swarming and doubling also will help much in the same, and is far more recommendable than supering, which, even with *A. Mellifica*, requires experience, when the latter has by generations of domestication become less liable to swarm naturally.

Such time as the bees cannot work in early spring and during the rains, may be occupied by working out foundations, to give to new swarms later on. These foundations are put into the middle of a brood nest of a strong stock, the bees working them out, and in the autumn of the year they will be busy capping over honey or thick syrup.

When combs are unevenly made, the uneven places may be cut out, and the bees given these combs to work out properly in spring; defective foundations may also be given to them to mend; full sheets of foundation and old comb, however, make the bees keep their comb straight.

To give the bees useful occupation, when it is too early for them to go out.

The bees begin working as soon as the weather becomes mild, or the rains are beginning to stop; and they show their anxiety to get out; care must then be taken to try and prevent this if it appears too soon.

When it is time, and there seems no danger of their getting chilled, open the hives, and examine them on a sunny morning. The floor board should be changed or cleaned, and the hive contracted, after taking out empty combs.

It is then the object of the bee-keeper to strengthen each stock, and this is accomplished by feeding with flour of dall, wheat, or flour candy and syrup, given slowly ; or some honey is uncapped in the hive at short intervals ; the brood increases and there are a multitude of workers got ready to give you the honey you want.

You must, however, be careful, as most probably you have *Apis Indica* to treat with, and the hive will with this stimulating feeding be full long before you think it is. Then they will swarm naturally, unless you take steps to prevent it, and they require a continued food supply, too, to feed the brood, which must be given slowly, and the extractor used to remove necessary stores ; and when the swarming season arrives, the bee-keeper must make artificial swarms, keep down queens or separate them. Breed drones early for the selection of stock, and so on, as recommended in the body of this work.

Then during the honey season he may extract his honey, and when autumn arrives, the feeding must be begun to allow the bees to cap their food in good time.

How to treat bees in spring, and how to do it.
Summer and Autumn with bees.

Winter arriving, the bees must be kept as quiet as possible. All extra and superfluous combs must be removed, the dummy drawn forward, and the hive thus contracted. The entrance should be likewise contracted. The hive should be packed with chaff, and covered with matting and straw rope. All unsealed honey should be removed, and a few holes cut in the combs one inch in diameter each, as winter passages or a few sticks laid across the top of the combs, so that the bees can cross from one comb to another under the quilt, which latter, however, must be carefully and well closed and be thick to keep in all the heat possible, and at the same time give off all excess of moisture taking place from evaporation.

If at any time there is bright sun, and the bees show an inclination to come out, the entrance to the hive should be shaded, or a shower from the fine nozzle of a watering pot be poured near the entrance, and the bees will retire, thinking probably it is raining. Even in the plains this latter operation must be done, to keep the bees in when they should not venture out too early before the rains are well over; and where it is too cold, before winter has quite worn off.

To keep bees and understand bee-keeping is not difficult, it requires observation, practice, and lastly, theory; all of which can be mastered by any native, even of the illiterate classes, who can be made to understand all that is necessary.

There is no doubt that bee-keeping will pay, and pay handsomely : but the business must be well understood.

To get the appliances for bee-keeping in India, Mr.

Where to get the bee hives
and appliances for bee cul-
ture.

Douglas has very kindly, as he writes, agreed to instruct any one who communicates with him on the subject regarding any minor point that is necessary, and has also made arrangements with certain men below mentioned who will supply the necessary bee hives and implements required for bee-keeping in India according to plans supplied by Mr. Douglas, with a view to their adoption in this country.

There is no doubt that there are many who think themselves ingenious enough to make improvements on beehives, and other implements, but let them first master the art of bee-keeping in practice before attempting such improvements: they are the outcome of experience, and this is at first bought dearly: probably by the loss of stock in many instances. These beehives and other etceteras are all very cheap, and quite adapted to this country.

Mr. Douglas has introduced foreign bees to this

The introduction of fore-
ign bees to India.

country, and has promised to help such as desire it by spreading the introduction to such people as apply to him in turn of application, giving the preference to those with practical knowledge; and justly so, because then there will be less danger of the loss of the varieties introduced at much cost and labor, bestowed in trying to multiply them.

The reader is recommended to get the following books on bees to study the theory: Dr. Dzierzon's "Rational Bee Culture" which is translated from the German, and Mr. Root's "A. B. C. of Bee Culture," which latter is recommended as particularly useful by Mr. Douglas, than whom there is no better authority in India, and to whom those few who have ventured to keep bees in India, have a large debt of gratitude to pay, as has also the author of this work, not only for his knowledge of the art, but also for many quotations and references he has made from the Handbook of Bee-keeping for India.

PRICE LIST OF APPLIANCES, HIVES, ETC., DESIGNED
FOR USE IN INDIA, BY MR. DOUGLAS.

NO.	ARTICLES AND DESCRIPTIONS.	Rs. A. P
1	Double-walled horizontal hive, unpainted ...	7 8 0
2	Ditto. ditto ditto, painted ..	8 4 0
3	Single-walled hive	1 0 0
4	Quilt of Gunny and Sheet necessary with above hive	0 3 0
5	Frames, per dozen	1 0 0
6	Dummy as necessary with each hive ...	0 2 0
7	Smoker. This burns paper, bagging, rope, decayed wood, or other like material which must be dry; it is fed from above, lighted from below, and if kept upright will not go out. It has a hook for hanging it on the side of the hive, and the smoke is projected on the bees by blowing through the hole in the bottom	0 12 0
8	Tin Can-feeder	0 3 0
9	Feeder stage on which a pickle bottle should be inserted, the mouth of the bottle being covered with any very coarse open cloth	0 2 0

No.	ARTICLES AND DESCRIPTIONS.	Rs. A P.
10	Fountain feeder : this is the feeder in the hive and is suitable for vertical hives	0 5 0
11	Queen's cage for caging the queen to prevent absconding, and in introducing queens	0 1 6
12	Extractor a tray on which the comb is laid with strings to swing it	0 12 0
13	Extractor with bamboo handle ; the same should be used in extracting from wild combs. A cheap double comb extractor is being devised, as these extractors are laborious to use, where the honey is very thick, or considerable in quantity	1 6 0
14	Comb fixers for fixing comb in frames in transferring, per dozen	0 15 0
15	Spray defuser for spraying bees with thin syrup and comb and hives with disinfectant solutions, asalicylic acid solution The side hole is stopped with the finger and the horizontal tube is blown through	0 6 0
16	Wax foundation, five cells to the inch, per lb. ...	1 6 0
17	Ditto ditto six ditto ditto per lb ...	1 6 0
The price of foundations will be lessened if the demand is sufficient to admit of this, the impure wax costs 12 annas a lb., and there is considerable loss in refining.		
18	One lb. section boxes, per dozen	0 12 0
19	Two lb. ditto ditto, per dozen	1 6 0
20	Section crate with glass ends	0 13 0
21	Zinc separators, per dozen	0 12 0
22	Section frame for working three sections inside hive with separators, tin	0 5 0
23	Section frame for working three sections inside hive with separators, wood	0 4 6
24	Packing No. 1 in crate, etc.	3 0 0
25	Ditto „ 2 „ „ „ „	2 0 0

“ Only one pattern of extractor and one pattern feeder are necessary, but one form may be preferred to another, and the cost of the extra pattern is trifling ;

pieces of comb should be preferred to foundations, when procurable, and small pieces of comb make the best starters."

Mr. Douglas writes " Letters and remittances relating to the supply of articles should be addressed to—

GUNESHAM NATHI MISTRY,

NUSHKERPORE,

Behala Post Office, near Calcutta,

or to

OMESH DASS MISTRY,

MONSATOILAH,

Near Calcutta,"

or through Mr. Douglas, Calcutta, who will kindly hand over the order to the contractors. The numbers in the list should be quoted, as the contractors do not understand English, and know the articles only by their numbers. It must be understood that Mr. Douglas makes no profit by giving these orders, and has only undertaken to do so to spread the art of bee-keeping, in which he has taken such great interest in India.



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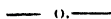
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